

BUDGET MODIFIED MOTORS August 1990 \$ 47380

Radio Control CAR ACTION

THE WORLD'S PREMIER R/C CAR MAGAZINE

Canada \$3.95

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DAYS OF

Thunder

MAX TRAX WEDGE

BASIC SOLDERING

CHAMPS SECRETS Inside Dobson's Car

Everyone Wins!

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ON THE COVER: Center: from the motion picture "Days of Thunder," the full-scale City Chevrolet is in the lead. Above right and lower left: action from the Speedworks Sportsman's Cup at Megatrak. Top right: Parma's 1/10-scale Mello Yello Chevy Lumina. Right: Budget modified motors. ("Days of Thunder" is a registered trademark of Paramount Pictures Corporation. Used by permission.)

EDITORIAL

by CHRIS CHIANELLI

OH, NO—IT'S BOZO! Despite popular demand, he's back—like a bad dream. Due to recent technological advances in *Car Action's* telecommunications, I beamed over from da rock-and-roll world. I unexpectedly erupted back into Air Age Publishing's tranquil day on my stripped '83 Hog with my band's CPA (and my personal astrologer), the very beautiful Brigitte Peugeot. After the understandably hasty hiring of Ms. Peugeot by Gregory's Funhouse, we discovered she speaks no English—a minor setback. Her employment, however, is chiseled in stone, so we're now looking for a French/English-speaking percussionist.

Anyway, much has happened since I've been AWOL, and the Philadelphia show helped me catch up on all the new products that I missed while I was on the road. I'd like to thank my long-lost race rats who let me know I was missed.

So anyway, we have a lot to cover this month. First, there's the Speedworks race—"From Megatrak with Pond" (sounds like a 1958 sci-fi movie). The concept of the Sportsman Cup Series is to raise the stature of the sport while involving amateurs at the same time—does that combination surprise anyone? (Well, maybe some of my friends; but all my friends are idiots.) There's also some much-requested information on budget motors, how to use the Lavco Cell Mate, and an explanation of the basics of soldering (an essential skill) by "Mud Otter" Murphy. Once again, the Ayatollah has pulled some strings: Paramount Pictures has sent us photos for the *Days of Thunder* preview—our master is magic! I told you we had a lot to cover!

Things are taking a bit of a twist around here. In future issues, we plan to feature more closeups of industry and racing personalities. Ms. Peugeot and I recently interrogated Joel Johnson at the Trinity skunkworks. The Magic Man 'fesses up big time in this interview. See?—we have great stuff for next month, too!

THE AYATOLLAH HAS DECREED: DEATH TO TEAM TREASON!

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LETTERS

We welcome your comments and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

MEGA-FUN!

My sons and I just returned from a very satisfying weekend at Megatrak—probably the finest facility at which we've raced. The real joy of this track isn't its magnificence but the dedication of Ed and Tony Angiulo and their family.

You'd probably count me in the minority: I'm thankful for ROAR; I like what John Thawley says and what he represents; and I'm not interested in using R/C car racing to get rich. There are a few people who say, "Win the A-Main, then sell your battery packs for \$80."

The most selfless individuals run Megatrak; they're more concerned with racers than with profit. People who sell Megadogs for a dollar (to a captive audience) should be applauded, for they're rare indeed.

We'll return to Megatrak often and urge others to do the same. These people deserve the support of every R/C racer because they represent the ideal that will enable R/C to grow and prosper. Again, a tip of the hat to Ed and Tony—and thanks.

FRANCIS J. CUPKA
Amherst, NY

Francis, it's always nice to hear about our readers' good experiences in the R/C world. Most people aren't involved in R/C for the money, but there are a few, as

you mentioned, who are. Don't knock the people who sell products: the ones who jack up the prices (e.g., \$140 battery packs) will eventually go out of business.

The people at Megatrak try hard to do a good job, and they were rewarded with a big-name race—Trinity's Sportsman's Cup Race. Most of the people and manufacturers are out there to sell a better product and help everyone they can. The people who sacrifice their time and effort won't be passed over. Without them, R/C wouldn't be in the great shape that it's in today!

AS

WHICH MOTOR?

Which motor should I run in my Big Boss: stock, 27T, 11T, or something in between? Should it be a single or double

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wind? When I change motors, which battery should I jump up to? The hobby stores in my area can't give me the help or supplies I seek, and when I send for information, I only get sales catalogues and prices—no spec information. Please help!

BRAD ELKINS
Gilbert, AZ

Brad, for your Big Boss, consider some of the motors made specifically for monster trucks. They range from 16 to 21 turns. It's generally assumed that the lower the number of turns, the faster the motor will be; however, don't buy 9- or 10-turn motors for your car or truck. They have too much power, so you'll only spin your tires if you even touch the throttle.

Stay within the manufacturers' recommendations, and you'll be OK.

AS

READY TO PULL

This letter is in response to the one from Suzie Augustyne about the World Championship Truck Pulls. I started out with an FX-10 a little over a year ago. In September, my father bought me a Big Brute, and a week later, I joined the NR/CTPA. Now, I also own a Double Dare. I didn't buy my trucks just for pulling—I bought them for fun. I even raced my Big Brute on a carpeted roadcourse against an Optima Mid and a Falcon. I didn't win, but I had a ball!

I cancelled my June leave (that's very hard to get) so I could attend the '90

World Championship Truck Pull in October. I made that decision after seeing the video. As for the monster-truck obstacle course, Suzie says it wasn't boring. I saw her run in the video, and the only thing I'll say is she needs more practice driving her Clod Buster.

Keep up the good work. *Radio Control Car Action* is the best R/C magazine.

TIM HUNTER
Box Elder, SD

Tim, the main thrust of this hobby is to have fun, not to spend, spend, spend, like some people do. While many people like to compete, some have forgotten what R/C started as—a hobby you should enjoy. We'll be seeing you at the World Champs!

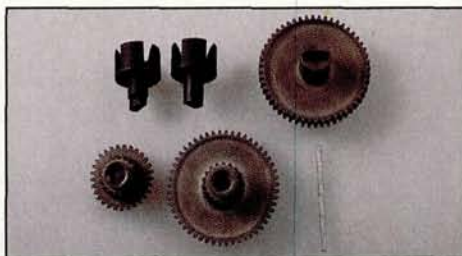
AS

(Continued on page 12)



MTXC0100
HD Aluminum Wheel Hub Set

A must for pulling applications, MaxTrax machined metal drive hubs offer super strong performance for all Kyosho monster trucks. Each package includes two hubs, eight drive pins, and eight hex screws.



MTXC0500
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(shown)

MTXC0200
HD Aluminum Shock Tower-Front

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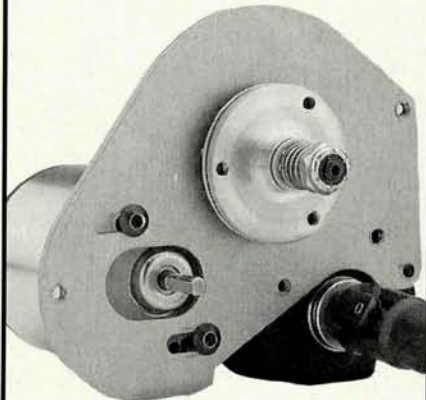
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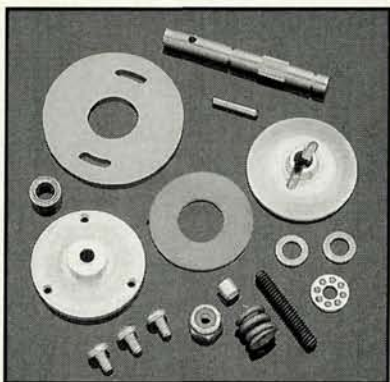
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PUBLISHER'S PAGE

by LOUIS DeFRANCESCO, JR.

Iwould like to share with you a letter that I received recently from Ernie Provetti, president of Trinity Products. I think it embodies our attitude and approach to this industry.

"Dear Louis:

"Something happened this weekend at our Speedworks Cup Race that I felt you should know about. As startling as it is for me to admit, Steve Pond made me realize why *Car Action* magazine is so important to Trinity.

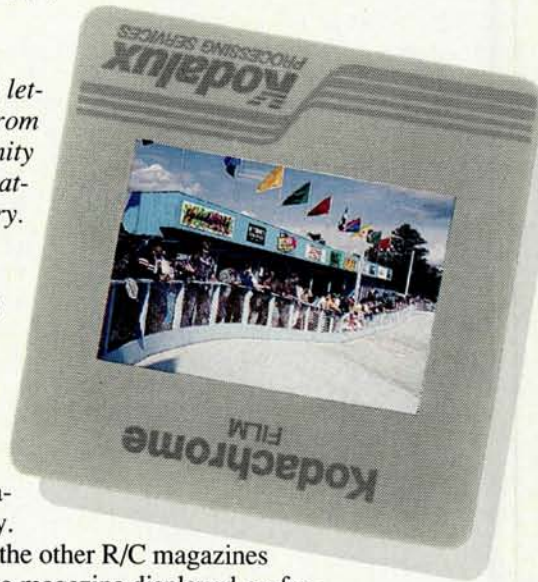
"As you may know, all of the other R/C magazines showed up for the race, but no magazine displayed professionalism and dedication to the hobby and the manufacturers more than *Car Action*. To watch Steve Pond, day after day, lying in the grass in the infield taking picture after picture from sunup to sundown made me finally realize how important *Car Action* is, not only to me, but to the entire industry.

"The race itself was overwhelming, and, I believe, even more successful than our original race in Detroit last year. Kyosho has already committed to join forces with us for the second race, and I would love to have more involvement from *Car Action*. If our industry is to grow, it will be because of races such as these. Let's get together soon to discuss the possibilities."

Thanks, Ernie, but Steve shares the attitude that's so prevalent here at *Car Action*, and that is to give our readers the best magazine possible—whatever it takes! We plan to be around for a long time. After all, this is fun, especially when you're number one and pulling away!

As for the Speedworks race concept, count me in! I'm all for helping amateur racers; they account for 99 percent of this hobby! Helping the "little guy" has always been our editorial philosophy. We sponsor some big invitational races, and now we'll be even more active in amateur racing. I hope the entire industry recognizes that helping amateurs and young racers will ensure the future growth of our hobby.

If you haven't already noticed, Chris Chianelli is back with us here at *Car Action* (he was gone only in body, not in spirit!), and it's been "brainstorm city" around here lately. Steve, Chris and I are planning to knock your socks off with the wildest stuff you've ever seen jammed between two covers of an R/C magazine! Rich Hemstreet and Wally David are no longer associated with this company in any way.



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King Cab Truck	189
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LETTERS

(Continued from page 9)

HOW'D YOU DO THAT?

I've been racing cars for about six years, and I really enjoy your mag. I saw your RC10 on-road conversion in *Car Action's* Stock Car Series issue. Wally David changed the suspension from the front to the rear with minor modification, then stiffened the front with the Fox tie-rod kit. How did he make the Buick body clear the front shock tower?

ALLEN SMITH
Lynnwood, WA

Allen, NASCAR bodies are higher than others, so you really don't have to change the front shock tower or make any mods. The tower should just touch the inside of the hood. Put a piece of electrical tape there, so you don't scrape the paint off the body.

AS

SAVE YOUR *&% WITH CAR ACTION!

On my way home from buying one of your magazines, I was going down a hill and smashed into a car. The doctor said that if I hadn't had that magazine in my coat, I would've broken my neck! I just wrote to say thank you.

TERRANCE REESE
Poughkeepsie, NY

Come on, Terry, did that really happen, or are you giving me the woolly bo-bo? I guess if any mag could save you, it's a fat issue of Car Action! We're glad you're all right, but I still want a doctor's note!

CC

LET'S GET REAL!

I don't know about you, but one of the main reasons I got into R/C was to build and race a vehicle that would look as close to the "real thing" as possible. There are a lot of really nice, innovative-looking vehicles out there, but what on earth are they supposed to look like? One of these freaks of nature appears on page 110 in the May '90 issue. When was the last time you saw a six-wheeled, 4WD truck racing full-scale?—never!

I'm not against progress, but come on! The name says it all—¹/₁₀-scale racing. Whether it's on-road, off-road, or stadium, it's still ¹/₁₀ scale—scale meaning to scale down from and to resemble a real vehicle. I'm for more show to go with all that hunger for speed!

MIKE LOPEZ
APO, NY (West Germany)

Mike, what you saw was a prototype six-wheeled truck that might not make it into production. It was just an experiment to see how well it could do. If these trucks ever threatened standard four-wheelers, they'd probably be legislated out of competition. People get into the hobby for different reasons—some like to race and experiment, while others, like you, like the scale aspect.

AS

A MAGNUM LOAD

I'm a very proud owner of a TRX-10 Bullet, and I think your article on the car was very good. Do you know of any high-performance transmissions for it (like RC10 or JR-X2 because of the similarity)?

Do you know anything about the ball diff's Traxxas is putting out? When will the graphite chassis and shock towers be available? Would any other hop-up parts fit my car?

JIM AJAMY
Milford, MI

Jim, I just saw all the Traxxas goodies at the Philadelphia show, and the ball diff and graphite chassis are ready. People often think they need graphite, when it's really a waste of money. In the case of the overweight Bullet, however, it pays off. I don't think you need to spend a lot of money on an exotic tranny, however. Using a ball diff and ball bearings and taking time to rework the tranny (as Steve Pond did in his July '89 article on the RC10 Torpedo) give great results.

CC

TRUCKS, NOT JUNK!

Robert G. O'Mea's letter (June '90) freaked me out! Robert, can you seriously tell me that Tamiya and Kyosho designed their monster trucks to be competitive against an RC10? No way! When these "outdated" trucks were designed, there were no conversion kits, and they were (and still are) more than competitive against each other. A "truck" such as the JR-XT has an unfair advantage because it's based on a brand-new high-performance buggy.

Think about this, Rob: these real monster trucks, which you so affectionately call "junk," weren't designed as off-road land missiles, so they shouldn't be raced against buggies converted to monster trucks *that are!*

CHAD MAWN
Rochester, NY

Chad, your letter is one of many we've received on this subject. It's true that the "new breed" of trucks can outrun all the older ones, but that's what they were designed to do. The older trucks are great for fun and other things that would kill some conversions (e.g., truck pulling). It's true that we need a separate class for the new styles of truck. For more information, check this month's "Truck Stop." AS

HIT THE ROAD

I own a Tamiya/MRC Hornet, and I want to convert it to an on-road car. I want to put on DuraTrax conversion wheels with foam slicks. They say they'll fit Tamiya cars. Will they work? Will I need to change the 540 motor that came with it? What else can I do to convert my car?

DAVE BOWERS
Phoenix, AZ

Dave, DuraTrax foam tires work well on the Hornet, but you need adaptors to fit them on your axles. You don't have to change your motor, but a different one will make you go faster, at the expense of some run time. For more information,

(Continued on page 22)



GRAPHITE ATTACK

When you're out on the track, bashing head-to-head with some serious competition, you've got to have the right equipment in order to win. The new TRX-T Eagle was designed by championship racers, and from the start, has been outfitted with all the lightweight hardware and premium racing accessories you need. For instance, each Eagle graphite chassis is individually molded and sealed. The precision ball differential uses all heavy-duty components and can be externally adjusted in seconds, right on the starting line. The driveline is smooth and efficient with all 48-pitch gears and splined telescoping driveshafts. Ball bearings and turnbuckles are used throughout the truck.

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Even before TRX-T Eagle's release, pre-production samples in the hands of Team driver Mike Hamilton, won the Roar Region IV Championship, top qualified at the N.O.R.R.C.A. Midwest Regionals, and won the Trophy Dash! If you're serious about your racing, and even more serious about winning, the TRX-T Eagle is for you.



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INSIDE SCOOP

by CHRIS CHIANELLI

The R/C car industry is rapidly advancing, with new products being offered at a head-spinning rate, so I'll make manufacturers nervous, but feed you R/C squirrels who are hungry for info, by bringing you a special report on security leaks and "late-in" items. Here goes!



CHRIS CRASH CRUISE

Parma owner Ken MacDowell and I are showing off a prototype 1/10-scale version of the Mello Yello team car. Licensed by Paramount Pictures, the body is modeled after the full-scale car in the movie *Days of Thunder*, starring Tom Cruise. *Car Action* will feature more on both the movie and the model in the very near future. Those are the

official Mello Yello colors I'm wearing—the very same suit (according to Parma) that Tom Terrific himself wore while doing promo shots for the movie. Yeah, sure; I believe that; people at the Philly show continually mistook me for his half brother. Definitely a resemblance, definitely; definitely pancakes on Wednesday!

UNEXPLAINABLE BANAMENON

Banana Man Dan Moynihan, of Dan's RC Stuff, reports that new racing-product ideas come to him when he sleeps in the infamous banana suit. The downside is his recur-



ring nightmare of being sliced into a giant bowl of corn flakes. Maybe that's why Dan reportedly needs only 45 minutes of sleep every night.



COMING HOME TO THUNDERDROME

Is it almost time for high speed on the high banks? I'm afraid so! All the R/C stock car superstars will be converging in Encino for the 1990 Thunderdrome on September 7, 8 and 9—the overly cautious need not apply! Under swaying palms and falling coconuts, the 1/10-scale land missiles will be circling the two-storey embankment. Don't miss the race-day ceremonies with the *Car Action* helicopter hovering over thousands of spectators. The heavyweights will wage door-to-door battle at outrageous speeds as manufacturers present their products under lots of big-top space. Be there or be square!



Turnabout is Fair Play



Here's the full-scale version of the Kyosho Big Boss. That's right, this \$75,000 Ford crusher, which boasts 1000 alcohol-thirsty horses, was modeled

after the 1/10-scale model. Sponsored by Kyosho, the full-scale crusher was built by Hall Brothers of Champaign, IL. On the right, also sponsored by



Kyosho, is the 800hp '51 Ford tank crusher—Heavy Metal—which rides on a WW II vintage M4 personnel carrier.

KYOSHO/TAMIYA REMATCH INEVITABLE!

Kyosho is back, gunning for the monster truck title. Here's a shot of the full- and 1/10-scale versions of the USA-1 at a full-scale crushing event. I had a chance to drive Kyosho's new 1/10-scale version at the Philly show, and my first impressions were very good. You may (or may not) remember that the Kyosho Double Dare didn't fare well against the Clod Buster in

our April '89 "Clash of the Titans." Well, Kyosho didn't take the defeat lying down. This new, 1/10-scale version of the 1988 TNT National Champ USA-1 is quick, it's much more sure-footed than the Double Dare, and it sports a very respectable 1 1/4 inches of fully independent suspension travel. It's inevitable—*Titan time is here again!*



LINGAFON UNEARTHS BATTERY SECRET!

That's right, the High Lingafon, my spy in the Far East, has once again returned with some major battery info. She reports that sometime in July, some new 1400 SCR cells will be hitting our shores. (For the time being, the manufacturer will remain nameless.) These cells will set new records on a Lavco unit; they top out at 540 to 580 seconds at a 10-amp discharge. (In case you don't know, the old 1200 SCRs topped out somewhere around 490 to 510.)

I'll see you next time—or sooner, if I catch you in my spyglass! CC

STEEL WHEELS

Here's a first-ever shot of Chicago Model International's 13-inch M-1 tank. This model features spring-loaded bogie wheels and two Mabuchi 380 motors. For full-scale performance, the treads have forward, stop and reverse. I checked out the video at the Philly show, and the M-1 is both fast and amphibious—a definite candidate for induction into Sergeant Major Danger's Heavy Metal Hall of Fame.



READERS' RIDES

Welcome to Readers' Rides. This is our way of giving recognition to the unique, innovative—and sometimes bizarre—vehicles that our readers have created. If you want to join the growing ranks of Readers' Rides winners, send us a sharp, uncluttered, well-exposed color photo (no Polaroids, please!) of your car or truck, along with a brief description. Who knows? The Ayatollah of Radio Controlla might pick your car.

If your ride is chosen, you'll receive a one-year subscription to *Car Action*, or we'll extend your existing one. You'll also be eligible for the second annual "Readers' Ride Car of the Year Contest" in the fall of 1990. Send your photos to Readers' Rides, R/C Car Action Magazine, 251 Danbury Rd., Wilton, CT 06897. Be sure to include your address and phone number, in case we need to contact you!

OLD RELIABLE

To set his RC10 apart from the pack, Arthur Faraci (of Hauppauge, NY) equipped it with a Novak T-4, a Reedy Competition Stock motor, Andy's A-arms and a Pro-Line body, which keeps dirt out. With this car in his arsenal, Arthur has set his sights on the top guns!



A BUDDING LEONARDO?

Set on winning concours, J.E. Lowery of Reaton, WA, painted this body for his RC10L. The car isn't just for show, though; with a Reedy Pink Dot motor, a Novak speed controller to move the juice, and a Novak mini-receiver

to make the Futaba S-132 sling the front wheels, it can really move! For better handling, J.E. replaced the stock aluminum lower motor-pod plate, which gets tweaked easily, with a homemade, graphite one. The body you see here is one of 37 that E.J. has painted. He can't seem to tear himself away from those paint-brushes!

LOOKING FOR A SPONSOR

At the grocery store, Rick Rockfellow of Sarasota, FL, saw the new Alpo cat food and knew he'd found a "sponsor" for his car. He started with a race-proven chassis—a Cobra III—and equipped it with all

the go-fast goodies he could find, e.g., a Tekin 600 ESC, Tekin mini-receiver, Futaba Magnum Jr. and a set of Indy Speed Wheels polished to a brilliant shine. This slick body was a Concours winner at the 1990 Reedy Race of Champions!



CRAYON CRUSHER

After seasons of helping to repair her father-in-law's Big Bear, Angie Dibble of Topeka, KS, was rewarded with a Blackfoot kit. With a love of crayons and a flair for art (she's a graphic artist), Angie whipped up this body. A few finishing touches—a Big Boss blower, working headlights and a plastic crayon over the antenna—and she had the ultimate crusher of crayons...and anything else!



STARS & STRIPES FOR THE KING

When he received his King Cab kit, Richard Palermo of Larchmont, NY, promptly stuck in a Futaba Magnum Jr. and an MC112B to relay the commands and channel the power. When it came to the truck's body, he didn't want the standard monochromatic paint job.

He drew nine sketches and knew this was the one! He applied the paint using a spray can, not an airbrush as you might think. Congratulations, Richard, for this patriotic paint job!



STUDIO SHOT

Robert Berglund of Olympia, WA, sent us this great studio shot. His JR-X2 has an extended graphite chassis, a Novak ESC, an H-arm conversion and a host of other hot stuff to make you envious. With a clean paint job and dyed-pink parts, it has the look of a great machine, but with "numerous 1st-place trophies," it's more than pretty!

TRICKY PHILIP?

Philip Berger (of Marlboro, MA) painted his New Era Pro Stocker in the colors of five-time IHRA national champion "Tricky" Rickie Smith, and he hopes to do as well as Rickie does on the drag-racing scene. With great accessories (a Quadra 35cc motor, New Era rubber tires, a wheelie bar and a working parachute) and an ET in the low 6's, there's no doubt that Philip and his car can be just as successful as their full-scale counterparts!

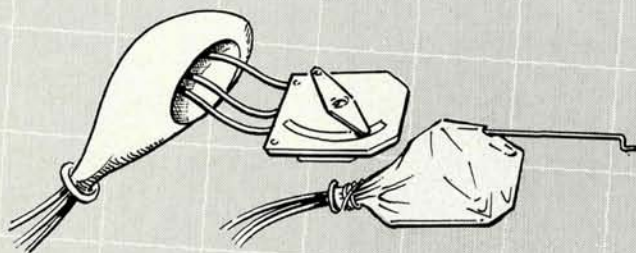


NOMADIC GREMLIN

Retro truck bodies are the latest fad in monster trucks. Jim Blackledge of Denver, CO, wanted to be different, so he put a '57 Chevy Nomad station wagon on his Double Dare! To cure its rolling-over problem, Jim extended the chassis by $\frac{3}{4}$ inch. He added Trinity Matched Madness motors, Thorp diffs and dogbones, oil-filled shocks, an electronic speed controller and two steering servos, which control the front and rear wheels separately. This brings new meaning to the term "grocery getter!"

PIT TIPS

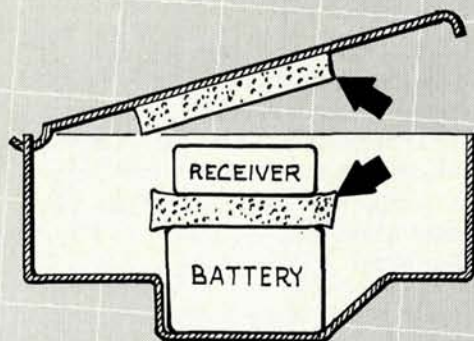
by JIM NEWMAN



SPEED-CONTROLLER DIRT EXCLUDER

Cut a small opening in the side of a balloon, then feed the speed controller's wires into it so that they emerge through its neck. Now you can stretch the balloon loosely over the speed controller and let the pushrod come through a small hole to the servo.

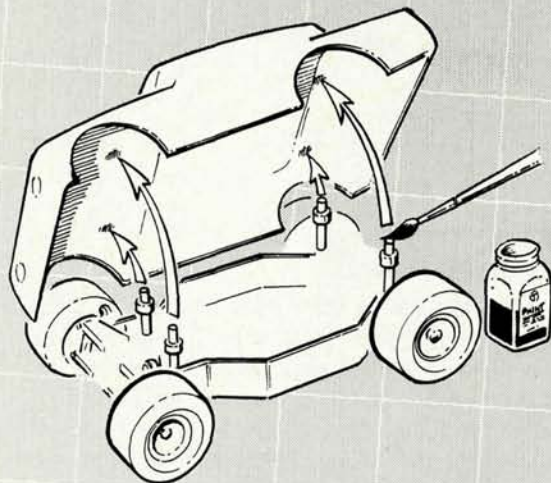
Tim Adkins, Irwin, PA



AUDI QUATTRO RECEIVER MOUNTING

Put a piece of 1/2-inch foam on top of the battery holder, then set the receiver on top of that. Before closing the box lid, put a second piece of foam rubber on top of the receiver. Provided the foam is *not* tightly compressed, this arrangement gives better vibration isolation than the usual double-sided tape.

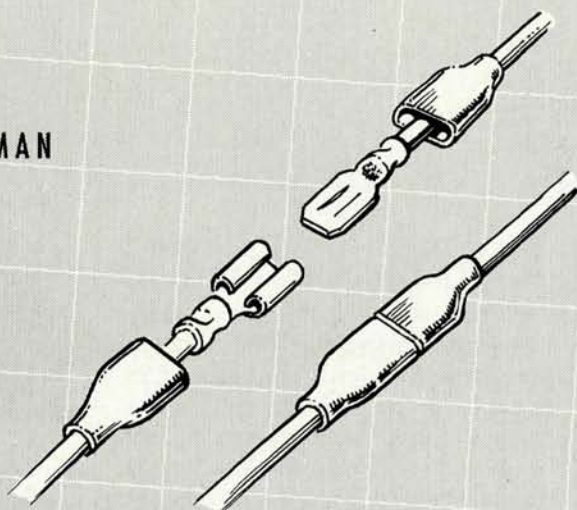
David Owens, Minneapolis, MN



BODY-MOUNT MARKING

Before you drill holes in that brand-new, painted, polycarbonate body, you'd better be certain of the exact positions of the mounting-post holes! Put paint on the top of each post; while it's still wet, carefully set the body into place. When you remove it, you'll find four dabs of paint marking the spots on which you should drill.

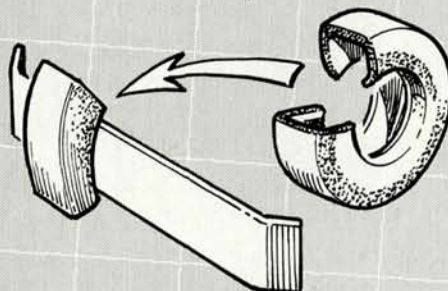
Jeff Koons, Carbon, IN



INEXPENSIVE CONNECTORS

Instead of buying the regular battery connectors at \$1.19 apiece, our economical contributor picked up a whole bagful at Radio Shack for the same price. He bought a set of solderless automobile spade connectors, which have an insulated jacket over each half. Steven tells us these work extremely well without hampering performance.

Steven Rubano, Howard Beach, NY



RUBBER BUMPER

Until he became more skilled, this driver safeguarded his car by cutting out sections of worn-out tires and securing them to his bumper with silicone glue and insulation tape. The curved rubber pieces provide better crash protection than the somewhat rigid plastic.

Dan Hagen, Wales, MA

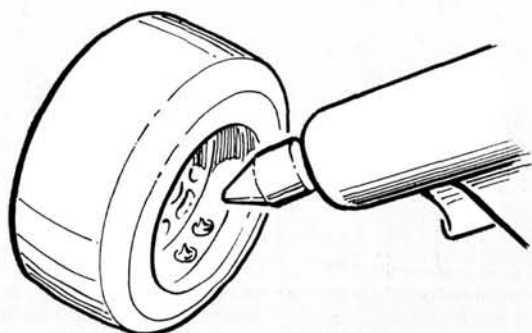


EASY ANTENNA INSERTION

Before trying to slip the antenna wire up through the plastic tube, insert the spray tube of a WD-40 can into the tubing and give a quick squirt. According to Ross, your antenna wire will slide through the tube surprisingly easily. (The WD-40 will quickly dry out.)

Ross Freedman, Beachwood, OH

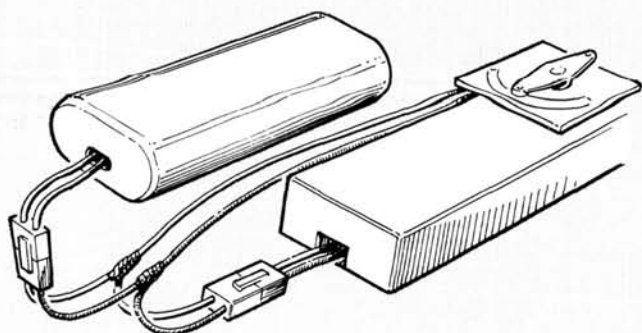
PIT TIPS



WHEEL-BALANCING WEIGHTS

Quickly attach balance weights to wheels by putting little dots of hot glue on the insides of the rims. It's certainly faster and easier than cutting off little pieces of self-stick lead.

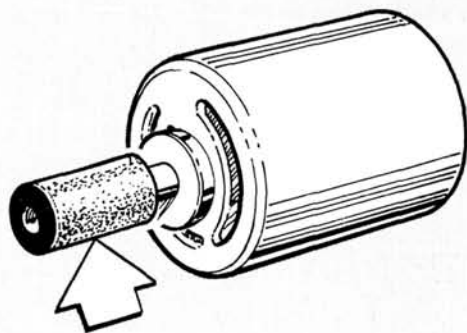
Don Miller, Hamilton Square, NJ



RAIDER SUSPENSION BOLT CURE

On tough courses, the Raider's upper suspension bolts tend to bend inwards. A simple cure is to wedge a 1/4-inch-thick aluminum piece between the bolt heads; you could even secure it with a wrap of insulating tape. If you can't find aluminum of this thickness, you could try a piece of hard maple from the model plane section of your hobby shop.

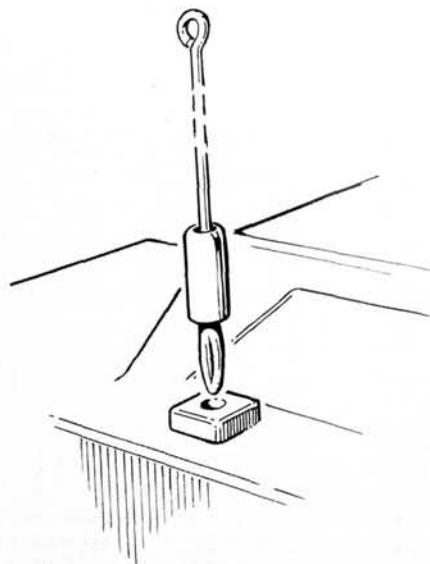
Andy Barton, Simpsonville, SC



EASY TWIST COMMUTATOR

This has been seen here before: when using an eraser to clean the segments, twist the commutator between finger and thumb. To make the motor shaft easier to grip, force a short piece of rubber tube onto it. Automotive vacuum tubing of the appropriate diameter works very well.

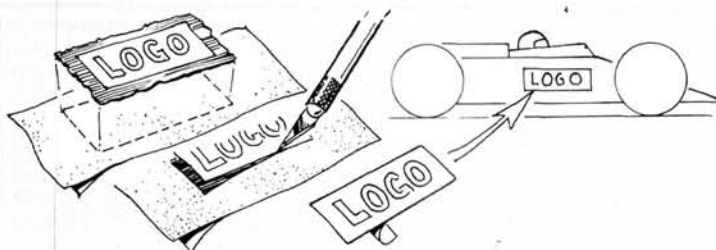
Tyler Johnson, Caledonia, WI



DOUBLE-CAPACITY CLOD BUSTER BATTERY

The twin motors of this vehicle quickly flatten the single Ni-Cd pack. Scott recommends that you put two packs in parallel to double battery capacity and lengthen run times considerably. Just bare the wires, solder a second plug into the leads as shown here, then carefully tape over the bare solder joint. Make sure both batteries are fully charged before you plug them together, or the low one will pull down the better one.

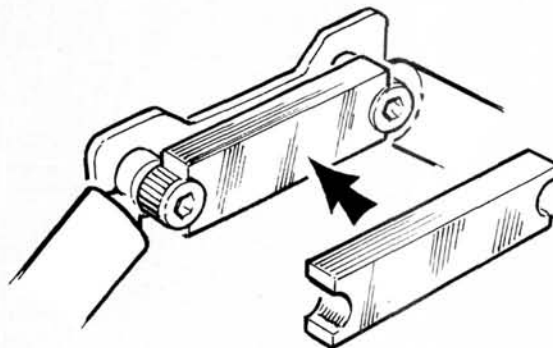
Scott Ryerson, Corning, NY



HOMEMADE DECALS

Cut out sponsor logos from auto magazines, then set them on a piece of double-sided adhesive carpet tape. Now, with a new blade in your hobby knife, carefully cut around the logo, peel the whole thing off the backing sheet and put it onto the side of your car. A thin coat of clear lacquer or varnish will keep the logos bright and shiny and protect them from water!

Blake Livelsberger, Gettysburg, PA



DETACHABLE ANTENNA

It's sometimes difficult to transport your car in a case without bending the wire antenna rod. Try this! Solder the antenna rod into a Radio Shack banana plug, then mount the socket on the side deck of your car. To travel, just unplug the antenna, but *don't leave home without it!*

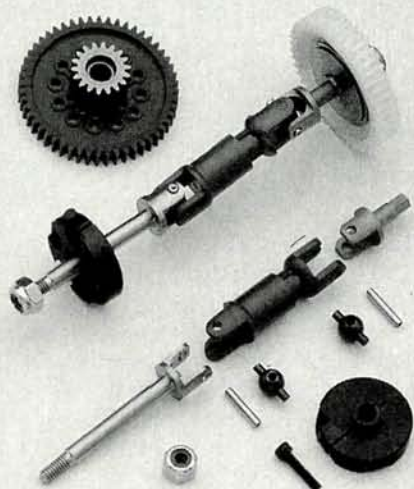
Tim Evans, Quarryville, PA

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LETTERS

(Continued from page 13)

check out the "Highway Hornet" article in the May '90 issue of R/C Car Action.

AS

WINNERS ATTRACT ATTENTION

I really don't care who finishes 8th in the M-main of a race. Mr. Triplett, if you want to see your name in lights, win the A-main! I enjoy reading about winners and looking at pictures of their cars. They inspire me. For some reason, you don't. Thank you for asking for my opinion.

I read R/C Car Action cover to cover every month, including the ads. Thanks for a great magazine.

ERIC SOROOS
Alexandria, VA

Eric, enough, enough! Stop sending letters about poor Mr. Triplett. I'm sure he's gotten the message! We're glad to see that you enjoy the magazine; we always try our best.

AS

TOP CAT CONVERSION?

In your June '90 issue, you show a picture of the new Schumacher car called the Cougar. Do you know if there will be a conversion kit for us Top Cat owners? I've been looking all over for the new TC parts that you reviewed. Thanks for your help, and keep up the good work!

MIKE ACHTER
Lexington, MA

Mike, all Cougar parts are interchangeable with those of the Top Cat, so you needn't worry about buying a new car. The parts that Rick Houle used in his "Top Cat Mods" article should be available through Trinity. Have your local hobby shop give them a call.

AS

DON'T FORGET THE FUN

Boy, am I ticked off! But before I go off the deep end, I'd like to say how much I look forward to receiving your magazine every month. Even though you have sev-

eral great authors on your staff (I'm partial to "Bad Brain" O'Brien for his article on the King Cab), the first thing I flip to is "Readers' Rides." I love to admire, and sometimes laugh at, the many innovative racing machines.

On to business—I just got the June issue, and when I read the letters, I nearly blew my top. My blood began to boil on reading the line, "...Blackfoots, Monster Beetles and Big Brutes, etc., are inferior junk pawned off on unknowing first-time buyers as 'innovative racing machines.'" Who does this clown think he is?! Has he ever heard of *fun*? Me and my friend (who happens to own a Big Brute) are happy to charge up as many batteries as we can and head to the woods for some mud-bogging, earth-pounding, down-and-dirty off-road-ing! I'd love to see an RC10 (not that it's a bad car) try to follow us!

CHRIS BARNES
Fords, NJ

Chris, you have to get used to the fact that there are more horses' asses on this earth than horses! Fun-spoilers can be found everywhere. The way to get even?—don't let them spoil yours.

CC

WHERE TO WRITE TO US

If you're writing to us (and we'd love to hear from you), please be sure to address your letters to "Letters," Radio Control Car Action, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to us in Connecticut, and this leads to long delays.

HOT TRACKS

Welcome to "Hot Tracks." Each month, we'll choose an outstanding track to feature in this column. To qualify, send in some high-quality, black-and-white photos of your track, along with a description (approximately 500 words), and tell us why your track should be chosen. Send your entries to Hot Tracks, Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897.

T.P.S. RACEWAY NEW CASTLE, DELAWARE

by MATT WOJTKOWIAK

FIRST IMPRESSIONS CAN be unpleasant, but not so when my son Matthew and I decided to try our luck at T.P.S. Raceway in New Castle, DE! Located in the New Castle Square Mall, the track's entrance is marked by a colorful sign, which hints at what's inside.

As we entered, we were impressed by the professional atmosphere. The carpeted oval track and timing tower are surrounded by a neat, nicely laid-out pit area. Well-lit and -powered pit benches are in abundance, and they keep racers close to the action while they work on their cars. During breaks in the action, you can feast on culinary delights at the adjacent concession stand!

The T.P.S. track has a 200-foot center line and 12-foot-wide lanes. Easily converted to a flat roadcourse, the track can hold a variety of racing events, and it's open seven days a week year-round: Monday and Tuesday are open practice days; Wednesday night is competition road racing; on Thursday night, production transmission cars hit the oval; and Friday night is for competition transmis-



sion cars (on the oval). Two racing sessions are held on Saturday—competition oval in the morning and production oval in the evening—while Sundays feature a variety of 1/12-scale events.

Pre-race drivers' meetings help things to run smoothly, as the turn marshalls'

duties, tech rules and proper conduct are all detailed in advance. Each racer can look forward to two qualifying heats and a main, so everyone enjoys plenty of racing action. An AMB electronic lap-counting system keeps track of laps and results, so there's little cause for disputes.

The track is supported by the Pit Stop R/C Specialist (a hobby store elsewhere in the mall), where racers can go for parts or repairs. Plans are underway to incorporate this hobby shop into the soon-to-be-expanded track area, thus making it a full-service operation.

For more information on schedules, hours of operation and directions, contact Mike Riello or Bob Ogden, T.P.S. Raceway, New Castle Square Mall, New Castle, DE 19720; (302) 328-6722. ■



HOLD ON!—Parma has joined forces with Paramount Pictures to produce 1/10-scale *Days of Thunder* stock cars!

THE LAST TIME Tom Cruise was strapped into a cockpit, his call sign was “Maverick,” his ride was a Navy F-14 Tomcat, and he was trying to pull lead on Soviet MiGs. This big-screen aerial extravaganza found you unconsciously contorting your head as you looked for “bogies” over your shoulder while pulling “high G’s.” And, yes, you had tears in your eyes when Cruise lost his good friend and backseater (NFO) “Goose” when they got caught in the jet wash of another F-14. And don’t forget how you jumped and cheered when Cruise climbed out of his Tomcat and was mobbed by the deck crew after splashing two (or was it three?) enemy MiGs! The movie, of course, was *Top Gun*.

by LOUIS DeFRANCESCO, JR.

DAYS OF



and self-discovery.

In an arrangement with Paramount Pictures, Parma International has obtained exclusive rights to produce a 1/10-scale R/C version of Cruise’s winning ride: the “Mello Yello” Chevrolet that’s featured in *Days Of Thunder*. The kit itself will feature a rolling

chassis design, stock-car wheels, a ball-type diff, invisible body mounts, a Lexan stock-car body and complete decal/detail sheets.

Parma also plans to produce other cars in this series. The best news to modelers is that the kit

will retail for only \$119, so many more can enjoy the thrills of superspeedway mania. We’ll have a full-blown track report on Parma’s new machine as soon as we get a production kit. As for the movie, I’ve seen some early clips, and I *guarantee* you’ll be contorting your head and pressing your right foot down as you try to pull lead and blast through those high-banked superspeedway turns with Tom Cruise!

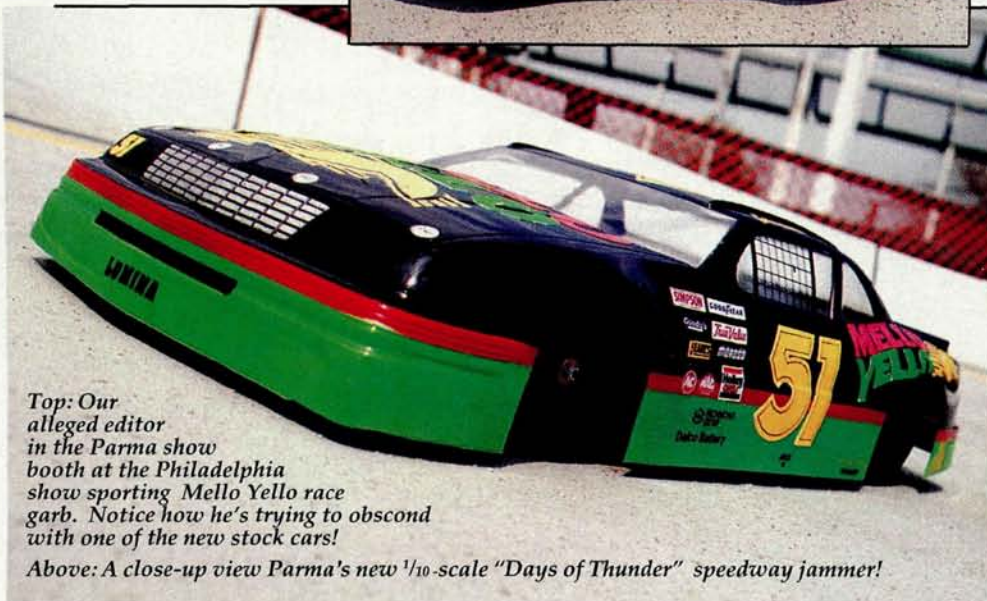
I want to thank Don Levy and Julia McCarrin of Paramount Pictures for sending us the movie stills and press info pronto!

Well, Tom Cruise is once again strapped into the cockpit, and he’s flying through the atmosphere at escape velocity; this time, however, he’s earthbound (sometimes!), he goes by the name of Cole Trickle, and his ride is a superspeedway Chevrolet.

Days of Thunder is the new release from Paramount, and the story is played out against the gritty, competitive world of superspeedway stock-car racing, where the lives of the drivers, crew chiefs and car owners are governed by the pulse-pounding excitement of this gruelling American sport. Cruise plays an ambitious, young race driver who embarks on a journey of personal endurance

Top: Our alleged editor in the Parma show booth at the Philadelphia show sporting Mello Yello race garb. Notice how he’s trying to obseond with one of the new stock cars!

Above: A close-up view Parma’s new 1/10-scale “Days of Thunder” speedway jammer!



CRUISIN' ON THE SET

Take a number-one actor, team him with the three talents who made two of the highest-grossing movies ever made ("Top Gun" and "Beverly Hills Cop II"), and what do you get?—this year's blockbuster: "Days of Thunder." Starring Tom Cruise (the story was his idea), produced by Don Simpson and Jerry Bruckheimer, and directed by Tony Scott, this movie brings this foursome together for another shot at greatness, and we think they've done it.

Producer Don Simpson says this is a movie about "characters...personal growth and...the difference between courage and bravery." Against the true-grit background of the NASCAR racing circuit, Cruise plays an ambitious racing driver who's ready to endure the rigors of the track and, in the process, he discovers what makes him tick. Cruise doesn't get all the best lines. There's a southern crew chief (Robert Duvall) who

has been enticed out of retirement to build the topnotch cars that will be a match for our main man's driving skills, and he doesn't think much of "them Yankees"—and the term covers anyone who isn't from the South! The young driver—fresh out of California and probably on intravenous orange juice!—and the dour older man are a perfect wisecrackin'—and racetrack—match.

"Racing isn't that different from acting," explained Cruise. "It challenges you physically and mentally. You can't go in and put your foot to the floor and expect to win. You have to think it out." Where did he get the idea for this movie? A few years ago, his friend and NASCAR team owner Rick Hendrick invited him to drive at the Daytona International Speedway, and the people "intrigued" him: "They work 16 hours a day, seven days a week prepping that car for the Sunday race—for that day of thunder. When they come together, the combination is *explosive*, and that's what excited me."

From its Southern roots, the popularity of NASCAR has spread country-wide, and

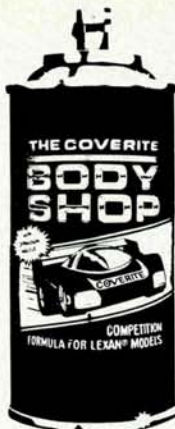


T to T scale Mello Yello speedway jammer—the "other" star of "Days of Thunder."

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WI residents will need to add \$1.15 sales tax per tape.
Please allow 2 to 3 weeks for delivery.

DAYS OF THUNDER



stock-car racing is now one of the best-attended sports. Each year, the Winston Cup Circuit sees 29 NASCAR-sanctioned "days of thunder"—the most important series in stock-car racing. To ensure absolute authenticity, the filmmakers attended 15 of these races and met the stars of the sport (people like Darrell Waltrip, Richard Petty and Rusty Wallace). They talked with these track legends, with pit crews, engineers, designers and journalists and, recalled Producer Jerry Bruckheimer, "...out of those interviews and the reality of the sport came our screenplay." In NASCAR, the cars are fairly equally matched, so when the engines roar, it's a test of skills, not machines.

ON LOCATION

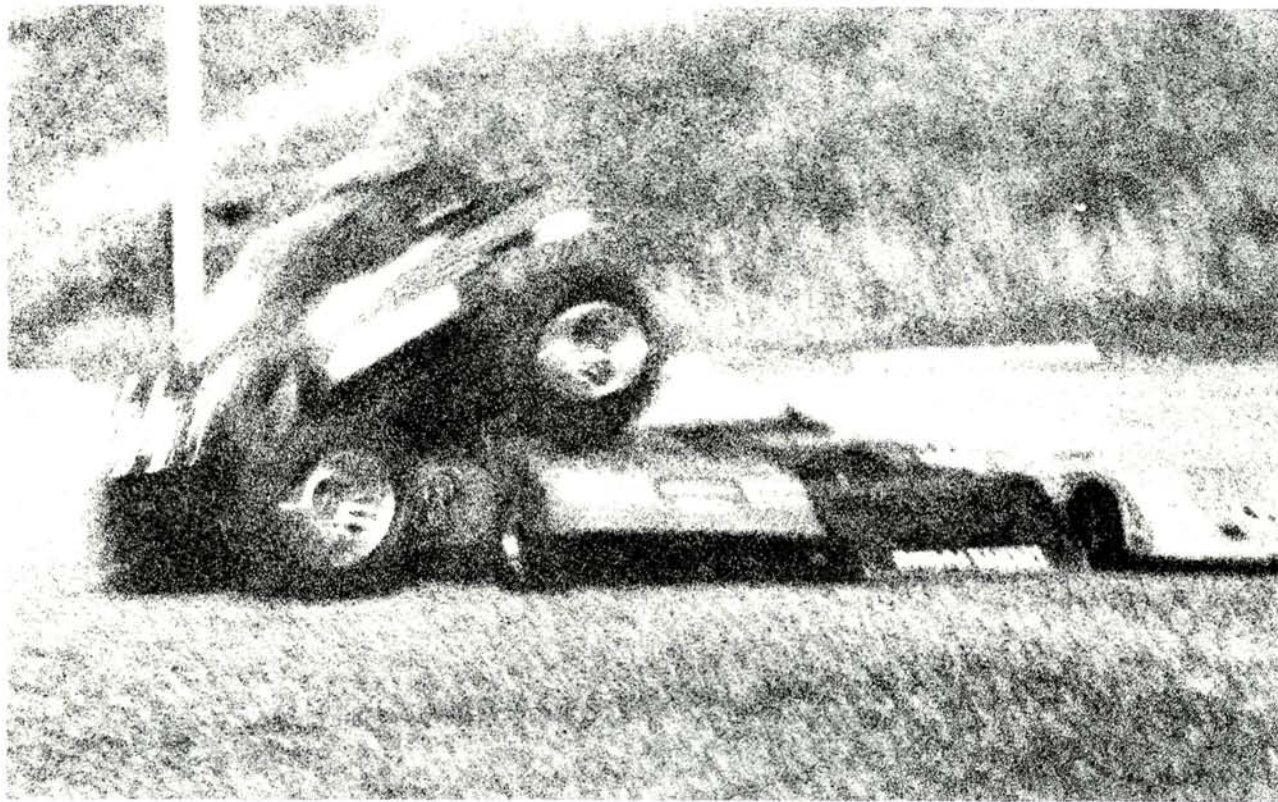
For several days early last November, the Phoenix International Raceway doubled as a movie set when three "Days of Thunder" cars driven by professional drivers qualified for, and were entered in, the Autoworks 500. As soon as the necessary footage was in the can, these cars were parked so that they wouldn't interfere with the outcome of the race.

In December, the cast crew were at the Charlotte Motor Speedway in North Carolina, and from there, they moved to Daytona Beach, FL, where they filmed the sport's most famous event—the Daytona 500—at the Daytona International Speedway.

NASCAR team owner and professional driver Rick Hendrick (the one who originally sparked Cruise's interest in stock-car racing) was on board to give expert advice, so you can be sure that "Days of Thunder" gives us a true picture of this mind-blowing sport. When the August heat burns you up, get inside and watch the stars burn up the track in Paramount Pictures' "Days of Thunder."

TRUCK STOP

by DAVE SPROUL



MONSTER—OR WHAT?

IN THE LAST "Truck Stop," I took a lighthearted look at the monster truck racing confusion—or maybe it was I who confused you. Anyway, let's take a more serious approach this time around.

MONSTERS VS. RACERS

I think the time has come to rename trucks that were designed as off-road racers. They should be called just what they are—racing trucks. Out of nothing more than habit, the JR-XTs, TRX-Ts, Nissan King Cabs, JG Conversions, etc., are often referred to as "monster trucks," but in most cases, this label isn't entirely correct.

Take a look at a full-scale monster truck: almost every popular monster truck uses 66-inch Goodyear Terra tires. This is a monster truck's most distinguishing feature (you know, "monster tires"). Now, if we convert that into $1/10$ scale, R/C monster trucks should use 6.6-inch tires.

In reality, only a few R/C trucks actually meet this criterion, so it's best to give others the benefit of the doubt and make

the comparison with the smaller 48-inch Goodyear tires. Again, scale down the 48-incher, and you have a 4.8-inch R/C tire. If you round that off to an even 5 inches, you could say that an R/C monster truck should use tires that are at least 5 inches in diameter. Consequently, the ever-growing class of trucks using smaller tires (i.e., in the 4-inch range) should be distinguished from the actual monster trucks



True $1/10$ -scale monsters with mammoth wheels and terra tires, trucks like the Clod Buster and High Roller were modeled after this full-scale arena crusher with its 66-inch Goodyears.

that use larger size tires by creating two separate categories.

The point I'm trying to make is that the Nissan King Cab and the JR-XT aren't monster trucks in the truest sense of the word. Their foundation is that of a high-performance car that's capable of substantially better performance. On the other hand, trucks like the Clod Buster and the USA-1 are designed as—and most definitely are—monster trucks.

What does this mean in the real world? It means that the new breed of racing trucks shouldn't compete against the monster trucks, because they have a distinct advantage. In the sidebar, I've listed my recommendations for distinguishing the racers from the monsters. This just categorizes the vehicles; class rules must determine the differences between stock and modified in either category.

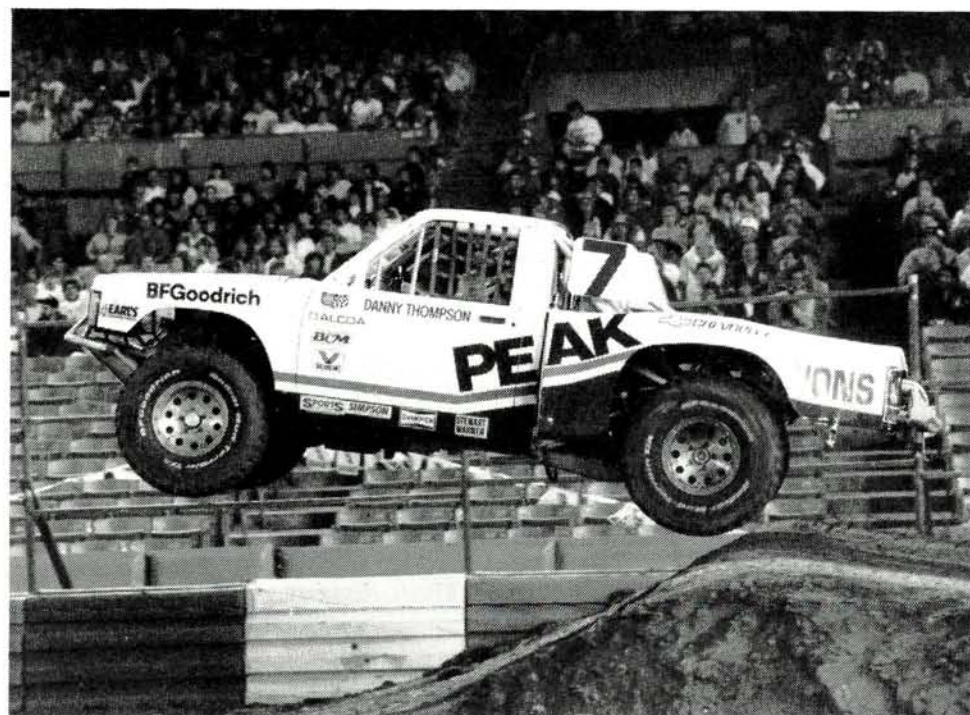
A TRUE MONSTER TRUCK?

To change the subject slightly, let's see what a true, full-scale, monster truck race is all about.

TRUCK STOP

In this sport, two monster trucks race over a course that usually consists of rows of junk cars, dirt mounds and, occasionally, a turn or two. They're set up like drag racing, sometimes complete with "Christmas-tree" start and electronic timers. If you compare that with Mickey Thompson-type stadium racing, which consists only of turns and jumps and uses entirely different trucks, you'll see the difference.

What difference does all this really make? With the rapidly growing interest in true monster truck racing, more people want to be involved in all aspects of R/C truck racing. In some cases, they might



be able to use one truck for both types of competition. In fact, before the new race-

designed trucks were introduced, the monsters were all there was to race, regardless of the surface. As the popularity of truck racing has increased, the trucks used for different types of racing have become as specialized as their full-scale counterparts. Although this makes racing more competitive, it also means that you'll need two entirely different trucks if you want to have any hope of winning.

To keep competition fair, monster trucks



Top: Danny Thompson's full-scale stadium racer. Bottom: JR-X2 truck conversion—very hot, but not a monster. Note wheel and tire size relationship from full to 1/10 scale.

shouldn't compete against racing trucks on the off-road tracks, and, conversely, race-bred trucks shouldn't compete against monster trucks in car crushing and other related events. Depending on the race format, each type of truck just has too much of an advantage.

I don't know if this will clear up any of the confusion on this issue, but perhaps it will help. As the truck market begins to expand, so will the variety of trucks—and so should the rules. Keeping trucks of different design in separate classes will make competition all the more enjoyable.

In the next edition of "Truck Stop," I'll show you how to detail Parma's Hemi engine to give your pulling truck that authentic concours look. Stay tuned! ■

HAVE A LITTLE CLASS

The only practical way of separating classes for monster trucks and racing trucks is by naming them, not trying to explain the differences. As new trucks come on the market, they should be identified and put in the proper list, because many new R/C drivers start with monster truck kits, and they should have a category in which to race on equal footing with other competitors.

MONSTER TRUCKS

- Tamiya** Blackfoot
Lunch Box
Midnight Pumpkin
Monster Beetle
Mud Blaster
Clod Buster
Bruiser
Kyosho Hi-Rider Vette
Big Brute
Big Boss
Double Dare
USA-1
Panda S-10 Stadium Racer
Royal Crusher
MRP High Roller
Marui Big Bear
Traxxas Sledgehammer
Aristo-Craft Wildebeest

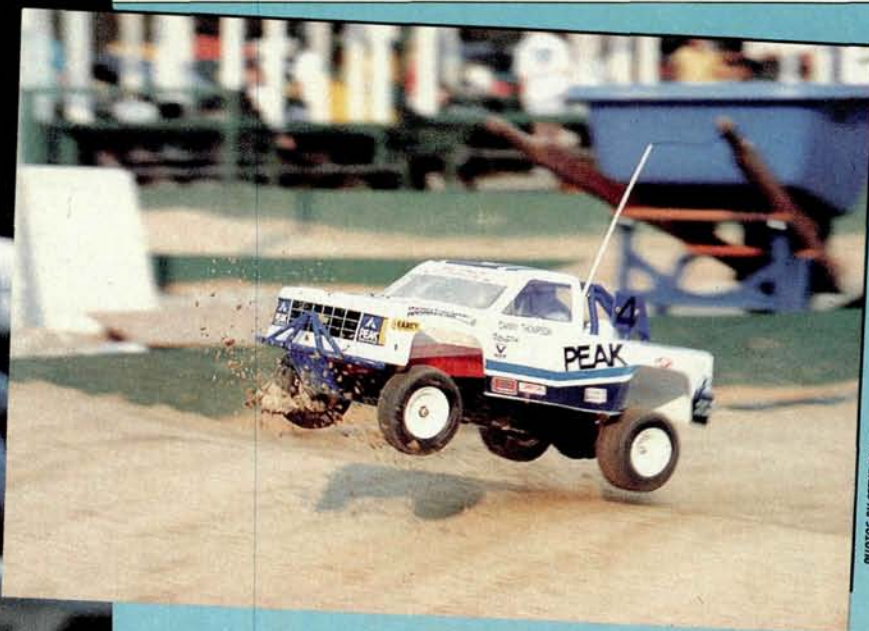
RACING TRUCKS

- Tamiya** Nissan King Cab
Traxxas TRX-T
Losi JR-XT
Most "monster truck" conversion kits.





WHO SAID EASY can't be fun and reliable?! For years, entry-level R/C fans have been left in the dust by all the big bucks cars and trucks flooding the market. Everyone assumes that you'll get more enjoyment out of your R/C vehicle if you spend lots of money. *Not so!*



PHOTOS BY STEVE POND

Panda's* R/C off-road racing series cars are advertised as "the best for your money," and I think the claim isn't far off the mark! The Stadium Racer is a twist on the well-known Panda off-road car. This truck has the hot look of those seemingly indestructible stadium racers, and it comes in an easy-to-build, reliable kit that's great for entry-level hobbyists.

PANDA PARTS

The Stadium Racer has a single-A-arm front suspension with non-adjustable control links, a pivoting ball-joint transaxle at the rear, and coil-over friction-type shocks

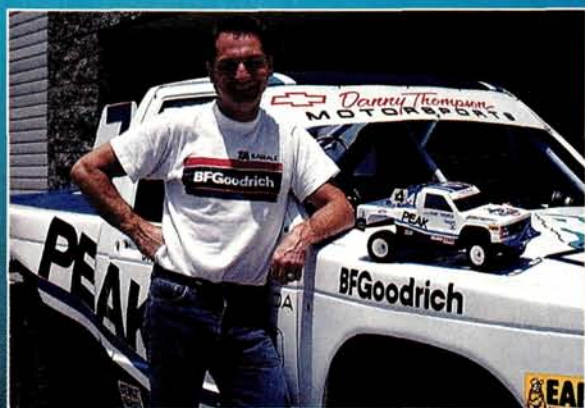
Stadium

A N D A - M O N I U M

by FRED MURPHY



The Panda Stadium Racer is a true "individual-component" truck, i.e.



POWERFUL PEAK PICK-UP

Mickey Thompson Stadium racing is probably the best-known form of full-scale off-road racing: ESPN carries virtually every event. Unlike desert races (e.g., the famous Baja events) that are run in wide-open expanses, these races are held throughout the Southwest in football stadiums. The spectators have ringside seats so they don't miss any of the action; TV audiences catch most of the excitement, too, and with instant replay, they can watch the best parts over and over!

Although other classes have more entrants, Grand National Sport Trucks is the most popular. These mini pickups are a handful to maneuver around the tight, bumpy tracks found on the Mickey Thompson circuit. Fenders and bumpers are frequently torn off during a race, but the trucks keep going. Even if a truck rolls over in one of the heats, the crew usually has it back on the track in time for the main event!

Panda has duplicated the truck driven by one of the sport's biggest names—Danny Thompson. His blue-and-white Peak Antifreeze truck is one of the best known on the stadium racing tour! Thompson's full-scale ride isn't just a modified Chevy S-10: underneath the body is a complete, specially built, chrome/moly tube frame. Power is provided by a 2.8-liter, V-6 Chevrolet racing engine. Because the races are so short, only a 4-gallon fuel tank is used. That's like running 900mAh $\frac{3}{4}$ SCRs for 1-minute races!

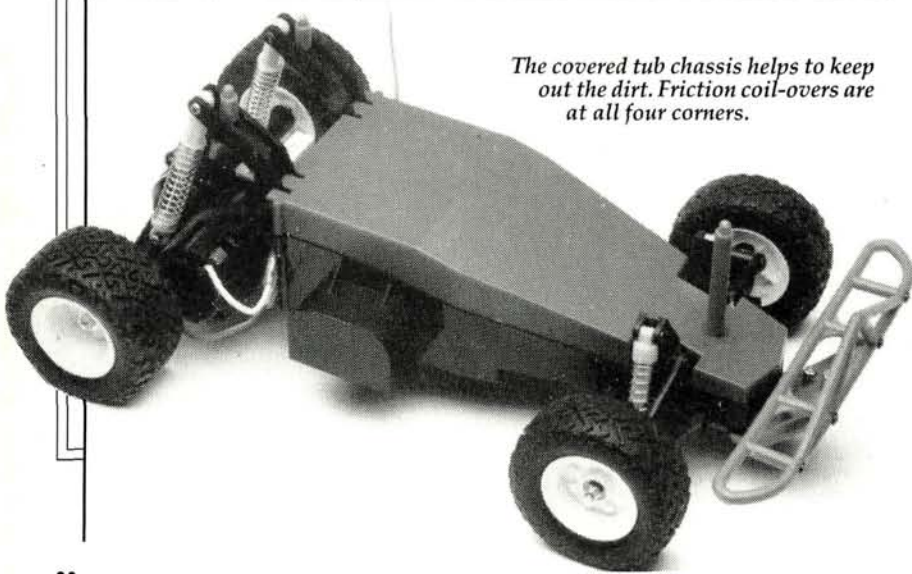
on all four corners. The gearbox is a sealed unit and houses a bevel-gear differential that rides on Oilite metal bushings. The powerplant is the traditional Mabuchi RS-540 stock motor, which is controlled by a three-step forward-and-reverse mechanical speed controller. All this is attached to a rugged, bathtub-type ABS chassis, which provides extra protection for the radio system and 6-cell racing pack.

The kit includes a set of specially designed stadium-tread tires that give good off-road traction as well as long on-road wear. Knowing that entry-level racers often run up and down the street or hit dirt piles, Panda had the foresight to choose tires with an all-around application. The truck's extra-wide front bumper, rugged polycarbonate Chevrolet pickup body and roll-bar system are all intended to provide more punch for the dollar.

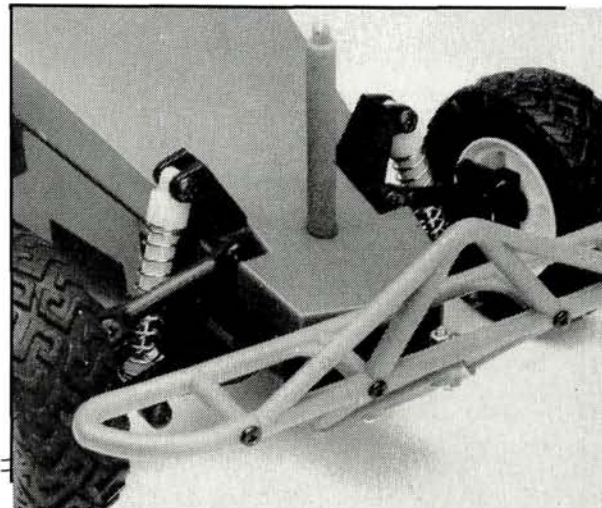
Assembling the Stadium Racer should take only a couple of hours, even for first-time builders. The parts bags and blister packs are well-marked, and the 32-step instruction manual is easy to follow. It takes you from the front suspension and shock building to gearbox assembly and installation of the radio system. It couldn't be easier!

I recommend that you use a radio system with battery eliminator circuitry (BEC). (A connector is provided on the speed control, so why not take advantage of it?!) If you choose not to use a BEC, you'll find it difficult to find a place for a receiver battery box, and you'll probably have to cut a hole in the chassis cover.

The Panda Stadium Racer is a true "individual-component" truck, i.e., it has no pre-installed circuit boards. The choice of which radio components to use



The covered tub chassis helps to keep out the dirt. Friction coil-overs are at all four corners.



The front suspension has lower A-arms and upper links. The substantial front bumper is even color-coordinated!

has no pre-installed circuit boards.

is yours, and this gives you the flexibility that some other entry-level, ready-to-run trucks lack. Repairs are easy, and hop-up components are available. If you want to add an electronic speed control, you can. A hotter motor? No problem. Everything is possible...but not necessarily on the first day!

TESTING, TESTING...1, 2, 3

Once your Panda Stadium Racer has been outfitted, perform a few bench tests to make sure everything is ready. First, charge your battery pack fully. If you do this while you're building, the truck will be ready to hit the road (or should I say the track?) when the assembly is complete.

Always follow this simple procedure for your radio system: before plugging the battery pack into the truck's main connector, turn on the transmitter, then the radio switch underneath the truck. (Make sure that the truck is elevated during this procedure.) Test the transmitter controls for proper left and right steering, as well as for forward and reverse throttle control. After you've done some pre-run tests, reverse the procedure: switch off the truck's radio system first, then the transmitter. This will ensure that the speed control stays in neutral, so the truck won't run out of control the next time you turn it on.

HITTIN' THE ROAD

The track test of the Stadium Racer was a real pleasure! This truck has plenty of power to handle dirt, grass, or sand. In general, the suspension provides good response, but the front shocks could be stiffer. Its soft front suspension causes the truck to bottom out easily, and this makes it more difficult to handle turns. You can easily rectify this problem by adding a tie-wrap to the shock housing above the spring. This will force the spring down more and make it stiffer and better for rough terrain.

When the Stadium Racer was fully broken-in, there was a noticeable improvement in run time—about 1 full minute. Smoother meshing of the gears made the RS 540 Mabuchi run cooler and with less battery drain. I noticed more side-to-side play in the axles, but, so far, the transmission hasn't stumbled at all.

Hopping-up the Stadium Racer is the next area I'll address. Let's see how far and how fast we can make this racer go! Until then, good luck and happy motoring!

**Here's the address of the company featured in this article: Panda; distributed by Global Hobbies, 10725 Ellis Ave., Fountain Valley, CA 92728. ■*



Although the live rear end is outdated, it does earn points for low maintenance.

GLOBAL HOBBY

PANDA STADIUM RACER

Type 2WD off-road
Scale 1/10
Sug. Retail Price \$119.95

DIMENSIONS:

Overall Length 16.5 inches
Width 8.31 inches
Height 7 inches
Wheelbase 10.13 inches
Front Track 7.75 inches
Rear Track 8.75 inches

WEIGHT:

Gross (w/bat.) 58 ounces

BODY:

Type Chevy Stadium Racer
Material Polycarbonate

CHASSIS:

Type Bathtub
Material ABS plastic

DRIVE TRAIN:

Primary Pinion/spur
Transmission Gear drive
Differential Gear
Bushings Bronze Oilite bushings

SUSPENSION:

Front: Type Lower A-arm, upper control link
Dampening Coil-over friction dampeners
Rear: Type Ridged axle with pivot ball
Dampening Coil-over friction dampeners

WHEELS:

Front: Type One-piece plastic
Dimensions (DxW) 1.75x1 inches
Rear: Type One-piece plastic
Dimensions (DxW) 1.75x1.50 inches

TIRES:

Front/Rear Rubber off-road treads

ELECTRICS:

Motor 540/05
Battery 6-cell stick*
Speed Controller 3-step mechanical

OPTIONS AS TESTED:

MRC Top Gun radio system; 6-cell Sanyo stick pack.

COMMENTS:

The Stadium Racer has plenty of power to handle dirt, grass and sand. The truck's suspension is responsive, but the soft front end causes it to bottom out. Realistic looks add to the package. I can't wait to try the hop-ups!

*not included

BUDGET

MODIFIED MOTORS

"BUDGET" is a relative term: what's in someone else's budget may not be in yours. When it comes to modified motors, however, "budget" refers to motors in the \$25 to \$50 range. All these motors are machine-wound, unlike the more expensive modified motors, which are hand-wound. In this class, there are two basic types of motor:

- those with bushings and no timing adjustment
- those with bearings and adjustable timing.

Bushing motors are for modelers who want to go fast for the price of a ROAR-legal, 27-turn, stock motor. These motors are treated like regular stock motors, as most have sealed end bells. Just bolt them in and go fast! These low-dollar land missiles have led many tracks to create an "Outlaw" or "Super" stock class, with the only limitation being a \$28 maximum retail price.

High speed at little investment doesn't come without sacrificing something. Generally, a 17-turn bushing motor won't go as fast—or last as long—as a full-fledged, \$80, ball-bearing, hand-wound, modified motor.

The next step up the ladder are motors that cost approximately \$50. Most of these budget modifieds have ball bearings and adjustable timing, and they're better balanced. Motors in this category are primarily intended for stock racers who want to experiment with modified motors but don't want to plunk down \$80. Some people find they aren't ready for—or don't like—running so fast; with these motors, they won't have spent as much money in their high-speed experiment.

These motors are also very popular with back-yard bashers and parking-lot prowlers who don't run their cars regularly.

When they do take their cars for a spin, they want to go fast, and they know that ball bearings and adjustable timing are what the really fast motors have. For these part-time users, a \$50 retail price tag is easier to swallow.

The first company to produce motors for budget-minded racers was Trinity; its Speedworks line was released in the summer of '88. Because of their mild timing, the motors were more reliable than the hot, stock motors with lots of timing advancement, yet they were faster because they had fewer turns of wire on the armature. Although other manufacturers were skeptical at first, most have followed Trinity's lead by producing budget offerings of their own.

To help you select the motor that's right for you, we've put together a guide to the available budget motors. The charts match the type of track with the name and/or part number of the motor that the manufacturer recommends. At the bottom of each chart, a breakdown of each motor lists its name and part number, number of turns, whether it has bearings or bushings, whether the timing is fixed or adjustable, and its retail price.

Although one motor may be recommended for a particular track, most of these motors would be effective in different applications if changes were made to the car's gear ratio. Just remember that budget modifieds aren't really intended for hard-core racing: they won't stand up to the abuse that's dished out in highly competitive races.

With all this in mind, we hope you'll find this guide helpful in introducing you to budget modified motors.



by STAFF



PHOTOS BY STEVE RONDO



ALTECH MARKETING



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Standard Series				
MT0827	21S	Bushings	Fixed	\$14.98
MT0824	24S	Bushings	Fixed	\$14.98
MT06527	27S	Bushings	Fixed	\$14.98
Racing Series				
R0821	21S	Bushings	Fixed	\$29.98
R08522	22S	Bushings	Fixed	\$29.98
RH26517	17D	Bearings	Adjustable	\$44.98
RH0918	18S	Bearings	Adjustable	\$44.98
RH25524	24D	Bearings	Adjustable	\$44.98

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	MT0821, RH26517
Low speed	MT0824, RH0918
OFF-ROAD 4WD	
High speed	RH26517
Low speed	R0821, RH0918
MONSTER TRUCK	
2WD	MT0821, R08522
DIRT-OVAL 2WD	
Long	RH26517
Short	MT0821, RH25524
DIRT-OVAL 4WD	
Long	RH26517
Short	RH0918, R0821
CARPET OVAL	
Long	RH26517
Short	RH0918, R0821
PAVED OVAL	
Long	RH26517
Short	RH0918, R0821
ROAD COURSE	
High speed	MT0821, RH26517
Low speed	MT0824, MT06527, RH0918

Altech Marketing, P.O. Box 391, Edison, NJ 08810 (201) 248-8738

MODIFIED MOTORS



TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	3215, 3017, 302
Low speed	3213, 3215, 3017
OFF-ROAD 4WD	
High speed	3213, 3017
Low speed	3213, 3215
MONSTER TRUCK	
2WD	3219, 3020
DIRT-OVAL 2WD	
Long	3213, 3215
Short	3213
DIRT-OVAL 4WD	
Long	3215, 3017
Short	3213, 3215
CARPET OVAL	
Long	3213, 3215
Short	3213
PAVED OVAL	
Long	3213, 3017
Short	3213, 3215
ROAD COURSE	
High speed	3213, 3017
Low speed	3213, 3215



B&R MOTOR WORKS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Sportsman Motors				
3017	17S	Bushings	Fixed	\$28
3020	20S	Bushings	Fixed	\$28
3023	23S	Bushings	Fixed	\$28
3213	13D	Bearings	Adjustable	\$45
3215	15D	Bearings	Adjustable	\$45

B&R Motor Works, 28000 Tothill Drive, Santa Clarita, CA 91350 (805) 296-0457

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	AK 15/0920
Low speed	AK 19/0915
OFF-ROAD 4WD	
High speed	AK 13/0925
Low speed	AK 15/0920
MONSTER TRUCK	
2WD	AK 19/0915
DIRT-OVAL 2WD	
Long	AK 13/0925
Short	AK 15/0920
DIRT-OVAL 4WD	
Long	AK 13/0925
Short	AK 13/0925
CARPET OVAL	
Long	AK 13/0925
Short	AK 15/0920
PAVED OVAL	
Long	AK 13/0925
Short	AK 15/0920
ROAD COURSE	
High speed	AK 15/0920
Low speed	AK 19/0915



CAM RACING MOTORS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Pro Stock				
Super Stock/0910 ..23S	Bushings	Fixed	\$28	
Ultra Stock/0911 ....17S	Bushings	Fixed	\$28	
Doseck's Ace Pilot Assault Series				
AK 19/0915	19D	Bearings	Adjustable ..	\$45
AK 15/0920	15D	Bearings	Adjustable ..	\$45
AK 13/0925	13D	Bearings	Adjustable ..	\$45

CAM Racing Motors, Inc, Rt 3 Box 680, Huntersville, NC 28078 (704)-875-9362

HOBBY PRODUCTS INTERNATIONAL

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Low speed	Sports 18/M-1012; Club Racer 18/M1023
OFF-ROAD 4WD	
High speed	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Low speed	Sports 18/M-1012; Club Racer 18/M1023
MONSTER TRUCK	
2WD	Sports 18/M-1012; Club Racer 18/M1023
DIRT-OVAL 2WD	
Long	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Short	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
DIRT-OVAL 4WD	
Long	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Short	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
CARPET OVAL	
Long	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Short	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
PAVED OVAL	
Long	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Short	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
ROAD COURSE	
High speed	Sports 15/M-1011; Club Racer 14/M-1021, 15/M-1022
Low speed	Sports 18/M-1012; Club Racer 15/M-1022, 18/M1023



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
UNO Sports				
Sports 15/M1011	15D	Bushings	Fixed	\$28
Sports 18/M1012	18D	Bushings	Fixed	\$28
UNO Club Racer				
Club Racer 14/M1021	14D	Bearings	Adjustable	\$45
Club Racer 15/M1022	15D	Bearings	Adjustable	\$45
Club Racer 18/M1023	18D	Bearings	Adjustable	\$45

Hobby Products International, 22600 C Lambert, Suite 904, El Toro, CA 92630 (714) 837-3250

KYOSHO



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Mega Motors				
Outlaw Stock				
/2246	22S	Bushings	Fixed	\$24.95
360/2477	22S	Bushings	Fixed	\$24.95
12x2/2471	12D	Bearings	Adjustable	\$39.95
14x2/2472	14D	Bearings	Adjustable	\$39.95
16x3/2473	16D	Bearings	Adjustable	\$39.95
18x2/2474	18D	Bearings	Adjustable	\$39.95
20x2/2475	20D	Bearings	Adjustable	\$39.95

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	2473
Low speed	2474
OFF-ROAD 4WD	
High speed	2472
Low speed	2473
MONSTER TRUCK	
2WD	2477
DIRT-OVAL 2WD	
Long	2471
Short	2472
DIRT-OVAL 4WD	
Long	2471
Short	2472
CARPET OVAL	
Long	2472
Short	2473
PAVED OVAL	
Long	2471
Short	2472
ROAD COURSE	
High speed	2474
Low speed	2475

Kyosho/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820 (217) 398-3630

MODIFIED MOTORS



TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	LC-4005
Low speed	LC-4007
OFF-ROAD 4WD	
High speed	LC-4003
Low speed	LC-4007
MONSTER TRUCK	
2WD	LC-4007
DIRT-OVAL 2WD	
Long	LC-4003
Short	LC-4005
DIRT-OVAL 4WD	
Long	LC-4003
Short	LC-4005
CARPET OVAL	
Long	LC-4005
Short	LC-4006
PAVED OVAL	
Long	LC-4003
Short	LC-4005
ROAD COURSE	
High speed	LC-4005
Low speed	LC-4007



LC SIDEWINDER

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Machine Wind				
Modifieds				
LC-4006	17S	Bushings	Fixed	\$28
LC-4003	13D	Bearings	Adjustable	\$45
LC-4005	15D	Bearings	Adjustable	\$45
LC-4007	19D	Bearings	Adjustable	\$45

LC Sidewinder, 215 East Wall Street, Grapevine, TX 76051 (817) 481-6887

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	EC017, EC015, EC019
Low speed	EC023, EC020, EC019
OFF-ROAD 4WD	
High speed	EC017, EC013
Low speed	EC017, EC015
MONSTER TRUCK	
2WD	EC023, EC019, EC020
DIRT-OVAL 2WD	
Long	EC013
Short	EC015
DIRT-OVAL 4WD	
Long	EC013
Short	EC013, EC015
CARPET OVAL	
Long	EC015, EC013
Short	EC015, EC013
PAVED OVAL	
Long	EC015, EC013
Short	EC015, EC013
ROAD COURSE	
High speed	EC015, EC013
Low speed	EC015, EC013

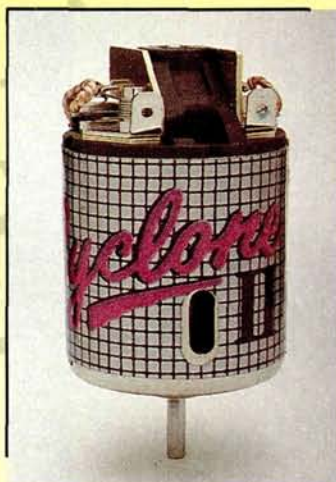


PARAGON RACING PRODUCTS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Eclipse				
EC017	17S	Bushings	Fixed	\$28
EC020	20S	Bushings	Fixed	\$28
EC023	23S	Bushings	Fixed	\$28
EC013	13D	Bearings	Adjustable	\$50
EC015	15D	Bearings	Adjustable	\$50
EC019	19D	Bearings	Adjustable	\$50

Paragon Racing Products, 690 Industrial Circle South, Shakopee, MN 55379 (612) 496-0091

PARMA INTERNATIONAL



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Cyclone II Ultra Stock				
14200	17S	Bushings	Fixed	\$25
Cyclone II Pro Modified				
14250	18D	Bushings	Adjustable	\$30
14251	16D	Bushings	Adjustable	\$30
Cyclone II Super Modified				
14300	17D	Bearings	Adjustable	\$45
14301	15D	Bearings	Adjustable	\$45
14302	13D	Bearings	Adjustable	\$45

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	14251, 14250
Low speed	14200
OFF-ROAD 4WD	
High speed	14302
Low speed	14301
MONSTER TRUCK	
2WD	14300
DIRT-OVAL 2WD	
Long	14302
Short	14302
DIRT-OVAL 4WD	
Long	14302
Short	14302
CARPET OVAL	
Long	14302
Short	14301
PAVED OVAL	
Long	14302
Short	14302
ROAD COURSE	
High speed	14251
Low speed	14300

Parma International, 13927 Progress Parkway, North Royalton, OH 44133 (216) 237-8650

QUARTER FLASH MOTORS



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Quick Silver Pro Stock				
202	17S	Bushings	Fixed	\$28
203	20S	Bushings	Fixed	\$28
Quick Silver Pro Modified				
151	15D	Bearings	Adjustable	\$45
152	19D	Bearings	Adjustable	\$45
153	13D	Bearings	Adjustable	\$45

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	153
Low speed	203, 152
OFF-ROAD 4WD	
High speed	153
Low speed	151
MONSTER TRUCK	
2WD	202
DIRT-OVAL 2WD	
Long	153
Short	151
DIRT-OVAL 4WD	
Long	153
Short	151
CARPET OVAL	
Long	151
Short	202
PAVED OVAL	
Long	153
Short	151
ROAD COURSE	
High speed	202, 151
Low speed	203, 152

Quarter Flash Motors, 1143 North Winstel, Tuscon, AZ 85716 (602) 290-0833

MODIFIED MOTORS

RACE PREP



TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	RP-911-14D
Low speed	RP-911-17S
OFF-ROAD 4WD	
High speed	RP-911-14D
Low speed	RP-911-17S
MONSTER TRUCK	
2WD	RP-911-17S
DIRT-OVAL 2WD	
Long	RP-911-14D
Short	RP-911-17S
DIRT-OVAL 4WD	
Long	RP-911-14D
Short	RP-911-17S
CARPET OVAL	
Long	RP-911-14D
Short	RP-911-17S
PAVED OVAL	
Long	RP-911-14D
Short	RP-911-17S
ROAD COURSE	
Long	RP-911-14D
Short	RP-911-17S

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Machine Power				
RP-911-14D	14D	Bearings	Adjustable	\$42
RP-911-17S	15D	Bearings	Adjustable	\$42

Race Prep/AYK Racing USA, 20115 Nordhoff Street, Chatsworth, CA 91311 (818) 709-6800

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	15D
Low speed	19D
OFF-ROAD 4WD	
High speed	15D
Low speed	19D
MONSTER TRUCK	
2WD	17S, 20S, 23S
DIRT-OVAL 2WD	
Long	15D
Short	15D, 13D
DIRT-OVAL 4WD	
Long	15D
Short	13D
CARPET OVAL	
Long	15D
Short	13D, 17S
PAVED OVAL	
Long	13D, 15D
Short	13D
ROAD COURSE	
High speed	15D, 17S
Low speed	15D



REDLINE MODIFIEDS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Super Rev Modifieds				
17S	17S	Bushings	Fixed	\$28
20S	20S	Bushings	Fixed	\$28
23S	23S	Bushings	Fixed	\$28
13D	13D	Bearings	Adjustable	\$45
15D	15D	Bearings	Adjustable	\$45
19D	19D	Bearings	Adjustable	\$45

Redline Modifieds, 9700 County Highway, C-25, Belleview, FL 32620 (904) 347-5151

REEDY MODIFIEDS

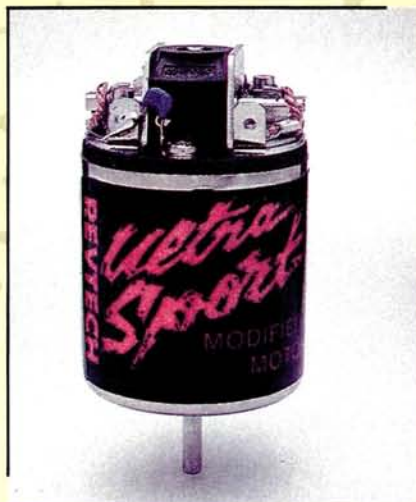


Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Esprit Sport				
Sport 12/3509	23S	Bushings	Fixed	\$28
Sport 4/6506	17S	Bushings	Fixed	\$28
Sport 2/6507	20S	Bushings	Fixed	\$28
Esprit Ultimate				
Ultimate 2/6508	19D	Bearings	Adjustable	\$45
Ultimate 4/6509	15D	Bearings	Adjustable	\$45
Ultimate Oval/6510	13D	Bearings	Adjustable	\$45

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	Sport 4/6506, Ultimate 4/6509
Low speed	Sport 4/6506, Ultimate 2/6508
OFF-ROAD 4WD	
High speed	Ultimate Oval/6510
Low speed	Ultimate 4/6509
MONSTER TRUCK	
2WD	Sport 2/6507, Ultimate 2/6508
DIRT-OVAL 2WD	
Long	Ultimate Oval/6510
Short	Sport 4/6506, Ultimate 4/6509
DIRT-OVAL 4WD	
Long	Ultimate Oval/6510
Short	Ultimate Oval/6510
CARPET OVAL	
Long	Ultimate Oval/6510
Short	Sport 4/6506, Ultimate 4/6509
PAVED OVAL	
Long	Sport 4/6506, Ultimate Oval/6510
Short	Sport 4/6506, Ultimate Oval/6510
ROAD COURSE	
High speed	Sport 4/6506, Ultimate Oval/6510
Low speed	Sport 4/6506, Ultimate 4/6509

Reedy Modifieds/Associated Electrics, 3585 Cadillac Avenue, Costa Mesa, CA 92626 (714) 850-9342

REVTECH



Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Super Sport				
SS-17	17S	Bushings	Fixed	\$28
SS-20	20S	Bushings	Fixed	\$28
SS-23	23S	Bushings	Fixed	\$28
Ultra Sport				
US-13	13D	Bearings	Adjustable	\$45
US-15	15D	Bearings	Adjustable	\$45
US-19	19D	Bearings	Adjustable	\$45

TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	SS-23, US-19
Low speed	SS-20, US-15
OFF-ROAD 4WD	
High speed	SS-20, US-15
Low speed	SS-17, US-15, US-13
MONSTER TRUCK	
2WD	SS-23, SS-20, US-19
DIRT-OVAL 2WD	
Long	SS-17, US-15, US-13
Short	SS-17, US-15, US-13
DIRT-OVAL 4WD	
Long	SS-17, US-15, US-13
Short	SS-17, US-15, US-13
CARPET OVAL	
Long	SS-17, US-15, US-13
Short	SS-17, US-15, US-13
PAVED OVAL	
Long	SS-17, US-19, US-15
Short	SS-17, US-15, US-13
ROAD COURSE	
High speed	SS-20, SS-17, US-19, US-15
Low speed	SS-17, US-15, US-13

Revtech, 7401 White Lane, Bakersfield, CA 93309 (805) 836-9099

MODIFIED MOTORS



TRACK TYPE	NAME/PART #
OFF-ROAD 2WD	
High speed	Pole Position/0007
Low speed	350 2WD/0003
OFF-ROAD 4WD	
High speed	Tony Neisinger Signature/0555
Low speed	427 4WD/0002
MONSTER TRUCK	
2WD	Monster Mash/0008
DIRT-OVAL 2WD	
Long	Monster Mash/0008
Short	350 2WD/0003
DIRT-OVAL 4WD	
Long	Tony Neisinger Signature/0555
Short	427 4WD/0002
CARPET OVAL	
Long	Tony Neisinger Signature/0555
Short	Pole Position 0007
PAVED OVAL	
Long	Tony Neisinger Signature/0555
Short	Pole Position/0007
ROAD COURSE	
High speed	Pole Position/0007
Low speed	Road Beast/0012



SPEEDWORKS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Speedworks				
Buggy Master/0001	20D	Bushing	Fixed	\$30
Dirt Oval /0004	25S	Bushing	Fixed	\$25
Super Speedway/0005	23S	Bushing	Fixed	\$25
427 4WD/0002	16D	Bearing	Adjustable	\$39
350 2WD/0003	18D	Bearing	Adjustable	\$39
Pole Position/0007	15D	Bearing	Adjustable	\$39
Monster Mash/0008	16S	Bearing	Adjustable	\$39
Road Beast/0012	20D	Bearing	Adjustable	\$39
Neisinger Sig./0555	14Q	Bearing	Adjustable	\$39

TRACK TYPE	NAME/PART #
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OFF-ROAD 2WD

High speed	3001, 3002, 3003, 3004
Low speed	3001, 3002, 3003, 3004

OFF-ROAD 4WD

High speed	3001, 3002, 3003, 3004
Low speed	3001, 3002, 3003, 3004

MONSTER TRUCK

2WD	3001, 3002, 3003, 3004
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DIRT-OVAL 2WD

Long	3001
Short	3003

DIRT-OVAL 4WD

Long	3001
Short	3003

CARPET OVAL

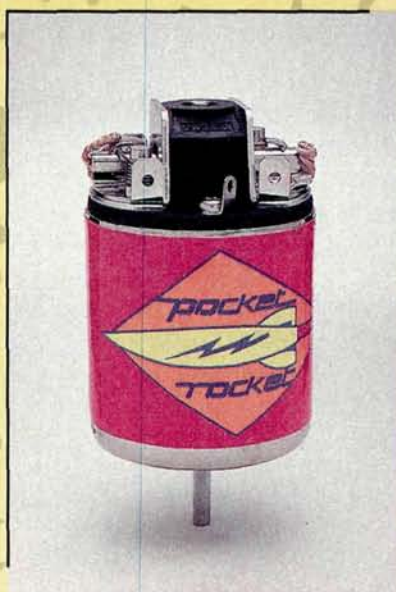
Long	3001
Short	3003

PAVED OVAL

Long	3001
Short	3003

ROAD COURSE

High speed	3001, 3003
Low speed	3001, 3002, 3003, 3004



TWISTER MOTORS

Name/ Part #	Turns	Bushings/ Bearings	Timing Adjust	Retail Price
Pocket Rockets				
3001	17S	Bushings	Fixed	\$28
3002	20S	Bushings	Fixed	\$28
3003	15D	Bearings	Adjustable	\$45
3004	19D	Bearings	Adjustable	\$45

Twister Motors, 657 East Arrow Highway, Glendora, CA 91740 (818) 914-6177

TWIN ENGINE TERROR.



Villain IV

SPECIFICATIONS

HULL	"Deep V" Offshore racing
WEIGHT	3.5 lbs. (w/o batteries)
LENGTH	31" Overall
BEAM	8.25" Overall
DRAFT	4.5"
DEAD RISE ANGLE	22 Degrees
MOTORS	Twin RS-540S With Aluminum Heat Sinks
DRIVE SYSTEM	Adjustable 2:1 gear Steerable Outdrives Counter-rotating Props
OILING SYSTEM	Built-in
PROPELLERS	Surface Piercing
TRIM ANGLE	Adjustable
SPEED CONTROL	Model 1501 - 4 Step FWD/REV Mech. Model 1508 - FWD/REV Electronic
RADIO	2-CH Stick Radio
BATTERIES	(1) or (2) 6-Cell
STAND	Mahogany (included)
APPROX. RUN TIME	8-12 Min. (2) 6-Cell 4-6 Min. (1) 6-Cell

Cruise quietly through a serene pond, or modify it to set the lake on fire. Villain IV combines the best of both worlds in one high performance off-shore racer. The twin 540 motors are linked with dual, 2:1 reduction, adjustable gear transmissions. The two steerable outdrive units are equipped for adjusting the trim angle so that optimum performance is extracted from the counter-rotating, surface-piercing, propellers. The sleek deep "V" hull is a true-to-scale reproduction of the actual Chaparral™ Villain IV. Its

proven design allows it to slice confidently through rough water with unmatched stability.

The assembled Villain IV is completely ready-to-float with a two-channel radio system and heavy-duty FWD/REV electronic speed control. Villain IV is also available as an easy-to-assemble kit which accepts all other component two-channel radio systems. If mind warping speed is your intent, ask your hobby dealer about inexpensive modifications which allow Villains to reach radar-clock-ed speeds of up to 26 MPH (so far!).

TRAXXAS

12150 Shiloh Rd. Dallas, TX 75224

DIRT DIGEST

by BILL O'BRIEN AND BOB KANE

DON'T TRASH THE CASH

SO I COME out of the Auto Show thinking about all the cars I can't afford (Ferrari, Porsche, Yugo) and boogie on over to Bruckner Hobbies to drown my sorrows in R/C equipment. What do my eyes behold, but a whole shelf of Futaba* 2PD transmitters! *R/C Car Action* gave the 3-channel PCM version a "Product of the Year Award," and I had a hankering to look it over. The 3PD 1024 PCM just didn't fit into my budget, so I grabbed one of the 2PDs and a fistful of rechargeable batteries, paid my dues and headed home.

The radio went into the corner for a few days (waiting for me to finish the third of five projects I was working on). Meanwhile, I get a new copy of "Tower Talk"—Tower Hobbies* catalogue. Right there in the middle of the catalogue is an ad for Novak 2-channel narrow-band FM receivers that will work with Futaba's new line of transmitters—even, the ad says, its PCM radio. (When the time finally comes for the narrow-band specification to take effect, he with the old-style receiver will most certainly crash. Your transmitter can bleed all over the place; it's the *receiver* that's the important part.



The Futaba 2PD/Magnum pleases racers and their bank accounts!

But that's another story.)

Well, I don't really believe that part about the PCM, but who makes a 2-channel FM radio on 27MHz or 75MHz? There are none listed in the catalogue. Could my 2PD be FM? That thought sends me into the corner to fish out the radio. No, the box clearly says "AM," but the owner's manual says there's also a 2PDF, which is an FM version! Great!...Not so great!...Nobody has one!

ASSAULT ON BATTERIES

As long as I have the radio out, I might as well fill it with batteries and zero the servos. Here's another surprise: Futaba ships the 2PD with a battery holder that has room for only seven, alkaline, AA cells. Alkies are 1.5 volts, and seven of them are enough to power the transmitter. Apparently, nobody told Futaba that you don't need to buy its \$30 rechargeable battery pack, but that you can buy AA-size individual rechargeable batteries for around \$2 each.

Unfortunately, they're rated at 1.2 volts, so you need eight, but you can't fit eight into the 2PD's battery holder because it has an insert riveted into place. Monday shows up two days later, and a quick trip to Radio Shack nets me a replacement battery holder with the correct number of vacant slots. The radio is great! It has a greater proportional response than any of the 12 pistol-style transmitters I own (two 2PKAs are included in that group)—with the exception of the XL2P. But the frustration!

Anyway, all this is leading to servos, because the 2PD I bought came with two 9301 super servos. I hate to think how many of them I have. If I stopped at two for every radio, that would leave me with about 40, but I have extras for helicopter radios and special ones for my gas cars and boats. And while I feel silly admit-



ting it, I've spent most of the last five years ignorant of just what the differences are between these servos, or even whether I use them correctly.

SEE SERVO RUN

A very basic servo primer would say that a servo is a motor coupled to a splined shaft through a series of gears. Given its own way, the motor in the servo would turn forever in one direction or the other, just as any motor would. But packed into the case with the motor is a small controller board that interprets the signals sent from your transmitter and moves the motor in the appropriate direction for a distance corresponding to the signal you've sent. That movement turns the servo horn and (we hope!) gets the job done.

More basic concepts: servos are rated in terms of their torque and their transit time. Torque is a physical representation of a servo's ability to do work. They're rated in ounce/inches, which roughly equates to the weight of the load a servo can move before it overloads and breaks down.

To give you a rough idea of what goes where, if you were selecting a servo for your Clod Buster or USA-1, you'd want something in the 50 ounce/inch to 75 ounce/inch range to move those massive tires. A 4WD, electric, off-road car might need a servo rated somewhere between 40 ounce/inch and 50 ounce/inch to steer the

DIRT DIGEST

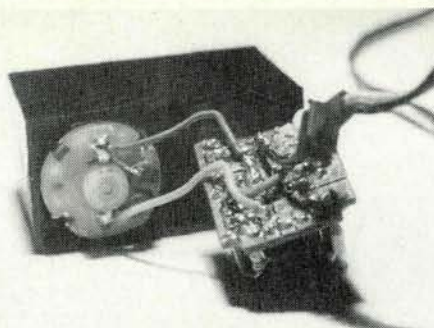
driven front wheels, and 2WD or 4WD gas cars (with appreciably more power coming from the engine) might be better with 50 ounce/inch to 60 ounce/inch servos. Electrics running only 2WD would probably get by with 30 ounce/inch to 45 ounce/inch servos.

Terrain, of course, is a determining factor. On rough tracks, you'll need to stay to the high side of a torque range to overcome the harshness of the track; and on smoother tracks, you can go to the low end. Driving style is another determinant. If you always try to power through corners or wait until the last minute to straighten out of a turn, you'll need more torque to pull you through.

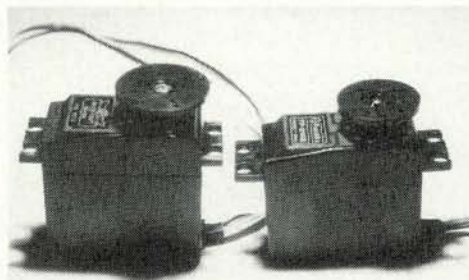
TIME BANDITS

Don't put all the emphasis on torque; transit time is also important in rating a servo. That's the amount of time it takes for the servo horn to move a specified number of degrees of arc, since all horn movement is, basically, circular. (There are linear servos, but they aren't used much by R/C car enthusiasts.)

The most-often-used arc distance for transit-time ratings is 60 degrees, which usually represents about half to one third of the full horn-travel distance. (Most car servos have a total travel arc somewhere between 120 and 180 degrees before they reach their lock—or stop—position.) Some manufacturers rate their transit



The tiny PC board on the right decodes information from the transmitter and tells the mini motor (left) what to do.



Depending on the car and the application, spending lots of money on a small, high-speed servo is sometimes unnecessary. Often, a larger, lower-priced, e.g., the Aristo-Craft HS-403, will do quite well. Both claim equal transit time.

speeds at 90 degrees; others use 45 degrees; but 60 degrees seems to be the most popular. The actual rating is done in fractions of a second.

Obviously, the shorter the time, the faster the servo will react. Fast servos are great on winding off-road courses and when you're running with a pack of not-

so-great drivers whom you'll have to dodge a lot. For safety—if for no other reason—fast servos are almost mandatory on gas cars. If you can steer quickly, you can avoid pedestrians. (Going off-road at 40 or 50mph, a stray car can break someone's leg.) Of course, there's a catch. Servos with a high torque rating usually have a slow transit time, and those with fast transit times typically have low torque ratings. That should be accurate for the servos most of us consider affordable (\$10 to \$30 range). If you're willing pay more (\$40 to \$70), you can start mixing fast times and high torque rates to better effect. You'll bump into size problems at the low end of that price range (inexpensive servos that attempt to be both fast and heavy-duty tend to be on the large side), but, like any problem, you can throw money at it until it goes away.

Use common sense. Don't buy a 60 ounce/inch, .20-second transit time, \$70 servo to run your Raider or your Madcap around the neighborhood. That's like using a Porsche to go grocery shopping. In fact, if you don't compete on at least a regional level with a car that cost at least \$200, it's difficult to justify paying more than \$30 for a steering servo. (There are design impediments in entry-level cars that limit the effectiveness of many high-performance add-ons.)

Sure, it would be slick as spit and turn on a dime, but if you don't use it for competition, you're just trying to impress your friends. And if you're trying to impress them with how much money you can throw away, it's just stupid. Your car is only one third of the winning combination.

NEXT MONTH

Next month, we'll do some Madcap upgrades. The suspension on that car is just too plain to last long. It might be entry-level, but you can bump it up a lot (quite a lot). Rumors have it that the Optima Mid is on its way out in favor of the Laser ZX. I was going to buy a ZX, but I decided on the 2PD and an Astro Flight 112 charger instead. (Yes, I know, I already have five different chargers.) In any case, the Mid is far from dead, and we'll be looking at one of the more complex modifications for it.

Be-deep, be-deep, de-deep; that's all folks!

**Here are the addresses of the companies mentioned in this article:*

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Tower Hobbies, P.O. Box 4021, Champaign, IL 61820.

Robinson Racing Products, 165N. Malena Dr., Orange, CA 92669.

SUPER, SIMPLE SPUR SOLUTION

I'm starting to feel like an action reporter. After writing the column on add-on components, I went to Bruckner Hobbies and heard one of the folk up there all-but quoting from my piece. (All right; he didn't say anything he hadn't been saying all along, but it was good to hear it anyway.)

Now, hardly a month after I bemoaned the mixed-gear-pitch situation on the Madcap, the Astute and the King Cab, here comes Robinson Racing* with a nearly perfect solution. (Well, perhaps they had been working on the solution before I wrote about it, and I have a good sense of timing.)

As usual, the folk at Robinson have come up with such a simple solution that it's surprising no one else has thought of it. To give you access to a wider, more available range of pinion gears, they've replaced the stock, Japanese, 48-pitch, metric spur gear with its American-style, decimal, 48-pitch equivalent.

"Hold on thar, Bobba-Louie," you're thinking. That spur is also an intermediate gear for the rest of the differential. What happens to that when you change the pitch? Have no fear; the new spur is actually an assembly

that has the transitional gear attached with two, round, head-hex screws. The immediate advantage is that when you wear out the spur part of the assembly (which won't be for a while, with these gears), you can bolt a new spur into place. And even if your

hobby shop doesn't stock specialty parts for any of those Tamiya cars, most good hobby stores will at least carry Robinson spur gears.

Four sizes are now available: 81, 85, 87 and 90 tooth. The limiting factor is the diameter of the differential case. Tied together with the correct selection of pinions, you'll have a winning combination.



SPEEDWORKS **SPORTSMAN'S** **CUP RACE**



CALLING ALL REV-HEADS
CALLING ALL REV-HEADS



Andy Dobson and Tony Neisinger get some heavy style points in the Invitational exhibition heat during these side-by-side flips with a twist.

SPORTSMAN'S CUP RACE



by STEVE POND

R/C RACING has come a long way since the days of alkaline cells and Mabuchi closed-end-bell motors. Today's cars are faster, more reliable, and run longer, but there's a price to pay for this technology.

The number of racers who want to compete in high-level racing is increasing, but many find it expensive to keep up with the competition. This type of racing at a national event has not only become a race to improve driving and chassis-tuning skills, but it has also become a race to the bank.



PHOTOS BY STEVE POND



One of the Concours winners: Bill Henning, with this awesome California Raisins body.



"With moderate driving skills and a good setup, you have a chance to win—but there's more to this series than just racing..."

CLIMBING OUT OF THE MONEY PIT

Trinity's Speedworks' division has created the Speedworks Sportsman's Cup Series for average racers who want to race at a national event. Entries are limited to non-sponsored drivers, and, to keep the competition fair, each entrant is given an identical motor. With moderate

driving skills and a good setup, you have a chance to win, but there's more to this Series than just racing.

SOMETHING FOR EVERYONE

The first of the three races was held on the high banks of the Megatrak Speedway in Browns Mills, NJ—a large, 500-foot concrete tri-oval that was completed just over a year ago and has become one of the country's premier oval racing facilities.

Throughout the event, invitational drivers hosted seminars that covered all aspects of racing, including advice on how to improve performance. A full-service speed shop supplied racers with all the necessary parts, and there were 160 covered pit areas and 150 outdoor pit tables, each with plenty of AC power. A large drivers' stand offered a bird's-eye



view of the track, and it included a tech area and a radio-impound area. An AMB computer lap-counting system was used with Don Holub's Pro Score program. Of course, no track would be complete without a snack bar, and Megatrak has a great one.

Friday was reserved for practice so that racers could get used to running on a high-banked track. Racing on cap tires was a new experience for many, and it made for some interesting practice, but most got the hang of it by the end of the day.

Above: Despite the racers' amateur status, the standard of driving was exceptional, but the adrenaline gets to everyone sometimes, and this is the result. Left: One of the many seminars given during the weekend, this was hosted by Tim Morton of TRC. He discussed the use and maintenance of cap and radial tires.



SPORTSMAN'S CUP RACE



Steve Weller of Lansdale, PA—another Concoors winner with this 7-Up T-Bird.



THE ACTION

At a drivers' meeting early on Saturday, Megatrak owners Tony and Ed Angioli and ROAR Administrator John Thawley reviewed the rules and procedures. Trinity's Ernie Provetti

thanked the drivers for attending the race and for their support.

This race sold out quickly, and the 250-entry

limit was soon reached. With eight cars in a heat, there were qualifying heats right down to the V-Main. Two qualifying rounds were scheduled for Saturday, and the final qualifying round took place on Sunday and was followed by the Mains.

SUPER SEMINARS

A number of seminars were held on Saturday. TRC's Tim Morton talked about how to choose and

maintain capped tires. Du-Mor R/C's Chris Morris discussed the new Corally SP10 1/10-scale car, and Trinity's Dave Willems and Kevin Mauer held a motor seminar. Bud Bartos of Bud's Racing Products showed racers how to set up their differentials properly (there were plenty of them whining on the track), and Joel Johnson discussed the new Magic Motorsports Commutator Machine.



Speedworks Sportsman's Triad Cup Winners

1/10 SCALE

Fin	Qual	Name	Laps	Time
1	2	Jonathan Moore	28	4:08.71
2	1	Thomas Lane	27	4:00.61
3	6	Rob Press	27	4:05.32
4	9	Leo Barana	26	4:01.07
5	5	Jamie Tennie	26	4:01.54
6	4	Brett Killman	26	4:03.89
7	7	Lawrence Mo	26	4:06.80
8	10	Jim Westerman	26	4:07.92
9	3	Mike Vrabel	24	4:01.08
10	8	Chester P.	22	4:04.79

1/12 SCALE

Fin	Qual	Name	Laps	Time
1	2	Scott Frazier	32	5:00.64
2	4	Chris Irrgang	32	5:02.87
3	10	Jack Johnson	31	5:02.29
4	3	Russ Cullen	31	5:05.07
5	7	Carlton Coleman	31	5:05.11
6	1	Danny McCutchen	30	5:00.60
7	5	Bob Kolmetzky	29	5:09.80
8	8	John Gardecki	14	3:39.04
9	9	Dave Elias	7	1:08.08
10	6	Chuck Rencurrel	0	DNS

PACESETTERS

Setting the pace for the 1/10-scale class was Thomas Lane, who turned in a 28-lap run in 4:08:9. This was one of three 28-lap runs; the other two were turned in by Jonathan Moore and Mike Vrabel. In the three-heat, 1/12-scale class, the

At many national races, invitational drivers are too busy preparing their cars for the next heat, so they can't answer questions, but here, professional drivers and company representatives were available to give help. There was an exhibition race at the Sportsman's Cup, but no one was trying to take home the A-Main, so there was time to help racers.

The racing started with the lowest Main (the V-Main), and all the qualifying rounds ran twice on Saturday. At first, cool temperatures made the traction a little slick, but conditions improved as the day progressed. The tires of choice were TRC Red Dot caps (or similar tires)—the softest compound available. Some racers ran Gold Dot tires, but if they got crossed up, the cold track made it difficult to start again. Racing at such high speeds takes its toll, and a lot of axles and other parts took a beating.

With a motor dyno set up at the end of the covered pit area, Trinity's Kevin Mauer tested motors, filed brushes and changed spring tensions. This was a tremendous help to racers who weren't sure what to do for these track conditions and to the knowledgeable racers who didn't have the equipment to test their motors' performance. Needless to say, this was the busiest corner of the pits.



Even with stock-class motors, speeds were fast enough to turn a few of the cars over.

pacesetters were Danny McCutchen with 31 laps in 5:04:8; Scott Frazier with 31 laps in 5:06:8; and Russ Cullen with 31 laps in 5:07:6. Much like the 1/10-scale class, these were the only 31-lap runs during the qualifying.

SPORTSMAN'S CUP RACE

This Miller Genuine Draft car was one of the sharpest-looking cars in the Concours contest.



YOU'RE DEAD MEAT



(from left to right):
John Thawley, Ernie Provetti
and Tim Morton hang over the
rail to check out the racing
action.



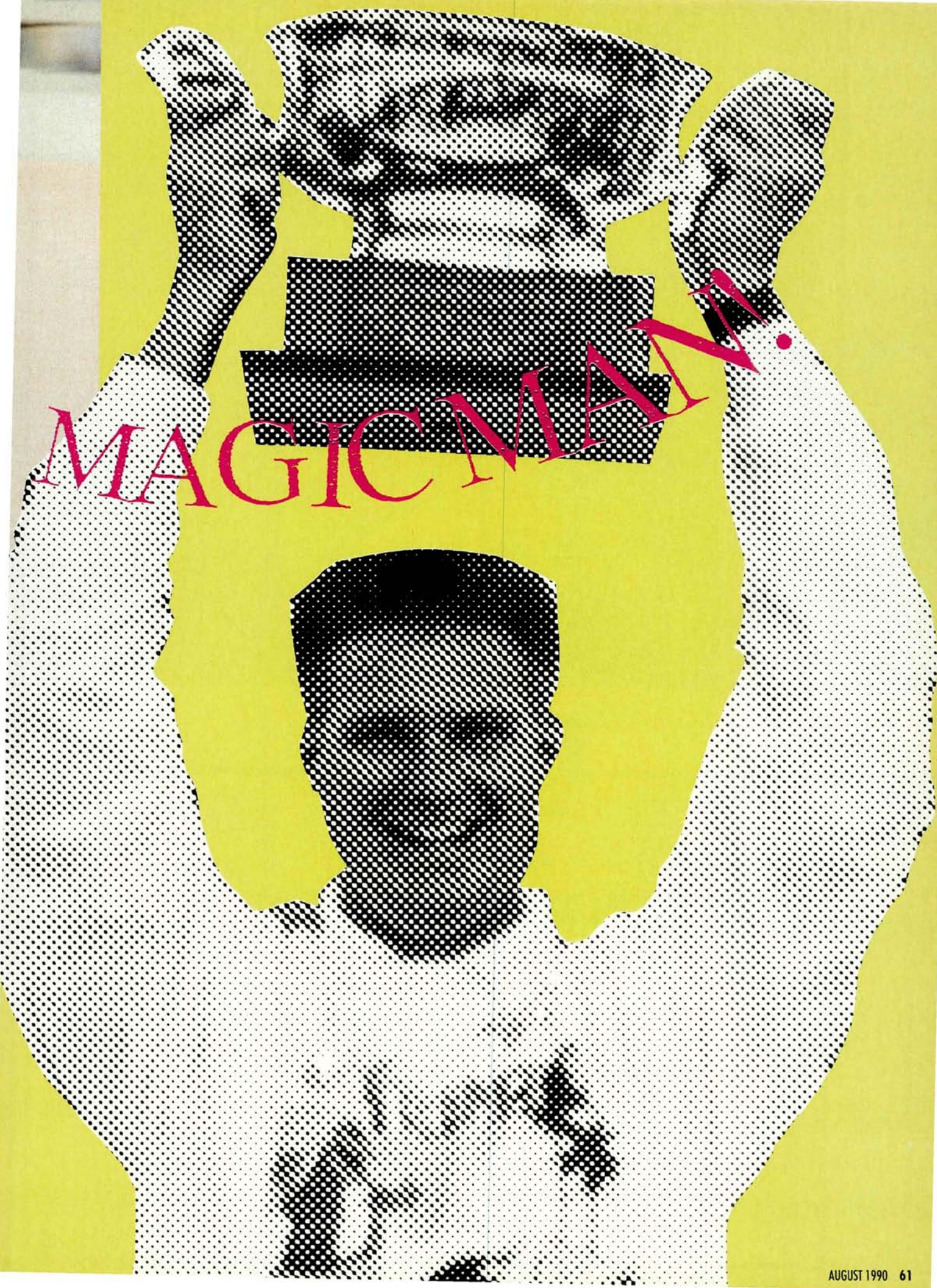
Because it rained heavily on Sunday morning, these times turned out to be the qualifying positions, and bad weather threatened to finish the event, with the qualifying positions as the final results.

While everyone was waiting for the rain to stop, several invitational drivers put together a Sunday-morning chassis seminar. Joel Johnson, Tony Neisinger, Bud Bartos, Jim Fuller, Andy Dobson, Rob Cutman, Paul Davis and Frank Calandra (now running for Du-Mor R/C, after bringing home the win at the first Sportsman's Cup in Detroit, last year) were present for the 2-hour rap session. It was *supposed* to be a chassis seminar, but almost every type of ques-

tion was fielded by the panel, and it was the most popular seminar. Many products were raffled or given away by Ernie Provetti.

SOGGY TRACK

The rain continued into the afternoon, and some thought that the Mains would have to be cancelled and the trophies awarded according to qualifying order. Just as the deadline approached for calling the race, a break in the clouds prompted a call to McGuire Air Force Base for a weather report. When the race organizers were told that the clouds were breaking, they decided to open the track for practice to help dry the surface. By 2 p.m., the rain did let up,



MAGIC MAN

racing resumed, and almost all of the 250 racers who had originally registered were still there! The final qualifying round was scratched because there wasn't enough time to run it and the Mains. The announcement that the racing would continue brought racers to the pits to charge their batteries.

The Mains started with the V-Main. Traction was good and the speeds were faster than those of qualifying because the rain had washed the dust and debris off the track. The fastest qualifying lap times were being topped as racers



Bud Bartos answering one of the many questions asked during the seminar on chassis.

went for broke.

Running the top three Mains first in each class was considered, but in an effort to be fair to all the racers, it was decided to

continue the Mains in the scheduled order. The sun shone for the rest of the day, and everyone had a chance to finish racing.

Put Together a Winning Diff—a Pro Tells How



With the assistance of John Thawley, Bud Bartos showed how he puts together his race-winning diffs.

Bud Bartos of Bud's Racing Products is known for his ability to put together a mean differential that runs very smoothly—a feature that makes a big difference to your car's handling. During the diff seminar, Bud gave away his trade secrets (although he insists that they aren't secrets).

Bud starts with a diff-pinning kit, because pinned diff rings can't slip during acceleration or hard cornering. With pins in the hubs, you have to use notched diff rings, which are available from Bud's and Magic Motorsports. When you've disassembled the diff and cleaned the components thoroughly, put a

new set of rings on the hubs. Then put the diff balls, which should also be replaced regularly, into the spur gear and lubricate them with a heavy silicone lube, which won't fly off as soon as your car starts to move.

Bud stressed that when you're tightening the diff, you must be careful not to tighten it

too much at first. He recommends that you tighten it in small increments until it becomes difficult to move the spur gear manually when you're holding both wheels steady. Over-tightening the diff can "dent" the diff rings, and this will make your new diff "notchy," so that it doesn't run smoothly.

On the other hand, if you run the diff too loose (as many racers did, in an attempt to compensate for their slick cap tires), you'll cause the diff balls to "flat-spot," and again, the diff will run roughly. When the diff slips, the rings grind away at either side of the diff balls, and this accelerates diff wear tremendously. When you're trying to get your car going on cap tires, it's best to run the diff tighter and use a smoother throttle finger.

Despite this advice, some racers insisted on running with a loose diff, and we often saw their cars stuck against the boards. Their motors whined as they tried to get their cars moving. They should have *listened!*

SPORTSMAN'S CUP RACE

NOTABLE PERFORMANCES

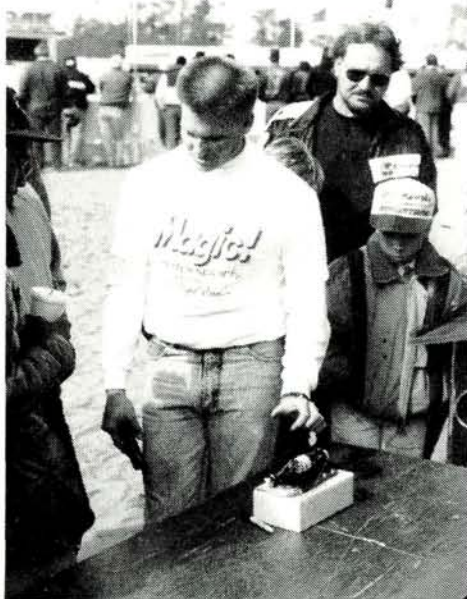
In 1/10-scale, Jonathan Moore won the A-Main, and Thomas Lane took 2nd (he had the TQ spot). There were two impressive runs in the D-Main: Steve Weller set the track record with a 28-lap run in 4:05.4, and Craig Evraets made a 28-lap run in 4:07.2. Both runs were fast enough to win the A-Main, and they weren't too far off the standing 29-lap Modified record set prior to the race.

Scott Frazier set a 1/12-scale stock-class record

be congratulated, but all participants benefit from a program like this—not just the winners. Manufacturers should make an effort to introduce this kind of racing into their programs.

Many thanks to those who made this event possible; especially to the event's sponsors and hosts—Trinity and Megatrak Speedway—and to the manufacturers and team drivers who took the time to attend. These include Trinity's Ernie Proveti, Tony P., Dave Willemms and Kevin Mauer;

Team Triad drivers Joel Johnson, Paul Davis, Jim Fuller, Tony Neisinger, Andy Dobson and Rob Cutman; Du-Mor R/C's Chris



Joel Johnson gave a quick demonstration of his new Magic Motorsports Commutator Machine.

with 32 laps in 5:00:6 as he drove from the back of the pack after a first-lap tangle, and Joel Johnson took the win in the invitation exhibition heats (the results were determined by averaging all three runs). In his final heat, Joel turned 30 laps with a stock motor, which is one lap faster than the previous modified record!

It's a tremendous accomplishment to place well in a race of this size, and the winners deserve to

Morris and Frank Calandra; TRC's Tim Morton; and Bud Bartos of Bud's Racing Products.

In early July, off-road Speedworks racing will be held in Detroit, MI, and the on-road race at the Ranch Pit Shop in Pomona, CA, will be held in early October. Seasoned racers and newcomers should try to attend one of these races. Even if you're not racing, there's plenty to learn. Don't miss it! ■

REV up your motor!



Kevin Mauer (left) and Dave Willemms gave tips on getting the best performance out of stock and modified motors.

Even experienced drivers find motor tuning and maintenance a mystery, but Kevin Mauer and Dave Willemms of Trinity can help. They've put together a motor seminar—one of the most popular ones at the Sportsman's Cup Series—that's primarily on how to tune-up and maintain stock motors (although modifieds are covered as well).

It's most important to keep your R/C car's electric motor clean by spraying it with a motor cleaner after each run. Motor sprays not only clean out dirt and debris from the motor and bushings (or bearings), but many also remove any carbon traces left on the commutator. To further clean the commutator, Mauer and Willemms recommend that you press a commutator cleaning stick lightly against the comm and spin the motor by hand a few times.

After a quick shot of motor spray, put one drop of bushing oil on each bushing, and put a drop of a lubricant that's designed for electric motors on the commutator. The procedure is similar for modified motors, but a lighter oil is used on the bearings.

Brushes and springs were also discussed. For the high banks of Megatrak Speedway, the suggested combination was medium to heavy springs and a hard-compound brush.

Racers who weren't well-versed in motor maintenance found this seminar very beneficial, and many returned to the pits to try some of the recommendations on their stock motors. Kevin Mauer ran the dyno to check whether these changes helped performance, and in almost every case, the cars ran much better!

If you attend any of the future Sportsman's Cup races, this is a "must-attend" seminar. You'll learn a lot, because these experts can answer any questions you might have—but you have to be there!

A peek inside the winner of the Reedy Race of Champions



INSIDE DOBSON'S CAR

by STEVE POND

PHOTOS BY STEVE POND

SOME RACERS DO everything possible to fine-tune their racing machines for that winning edge, and they'll do just as much to protect the fruits of their hard labor from the eyes of the curious. Seldom can you get a good look at what your competitors have done to their cars to make them so fast, so this article is a real Car Action scoop! This R/C car can be seen in almost any type of racing—from Gasoline Alley at the Indy 500 to the weekly races at your local track.

Andy Dobson and Team Triad agreed to let us examine Andy's victorious Reedy Race of Champions car, and we can now tell the rest of the world just how it was set up to win one of R/C's most grueling races. In the Race of Champions, invitational drivers race eight heats, six

of which are counted in the overall results, and the last one is compulsory. No flash-in-the-pan racer can dominate this event; consistency is the key.

What separates Dobson's Composite Craft/TRC* Lynx II from the rest of the field? Its basic design is

quite something, and during the short time that it has been available, it has become the car to beat.

The stock Lynx II has a unique floating rear pod, a large-diameter front axle with adjustable caster, large 5/32-inch kingpins and a light graphite chassis.

DOB'S MODS

Dobson's modifications started at the front end. He cut the large-diameter axle in half, then drilled through the center of each side. By putting a section of drill blank into the holes that he had drilled, he joined the axle in the center and used a $\frac{3}{8}$ -inch spacer. This allows independent caster adjustment for each wheel, and on a large oval track, this can be very helpful.

Instead of keeping the axle in place with the standard cinch block, a set of custom cradles was machined and pinned to the axle just inside the stock axle-mounting locations. On each of these cradles, just in front of and just behind the axle, a setscrew allows for micrometer-precise caster adjustment. Another benefit of this is that, in a collision, the axle can't move from side to side, and the caster angle can't be altered unless you break the chassis. Unlike the standard axle, which has vertical kingpins, this axle has been drilled for 2 degrees of camber.

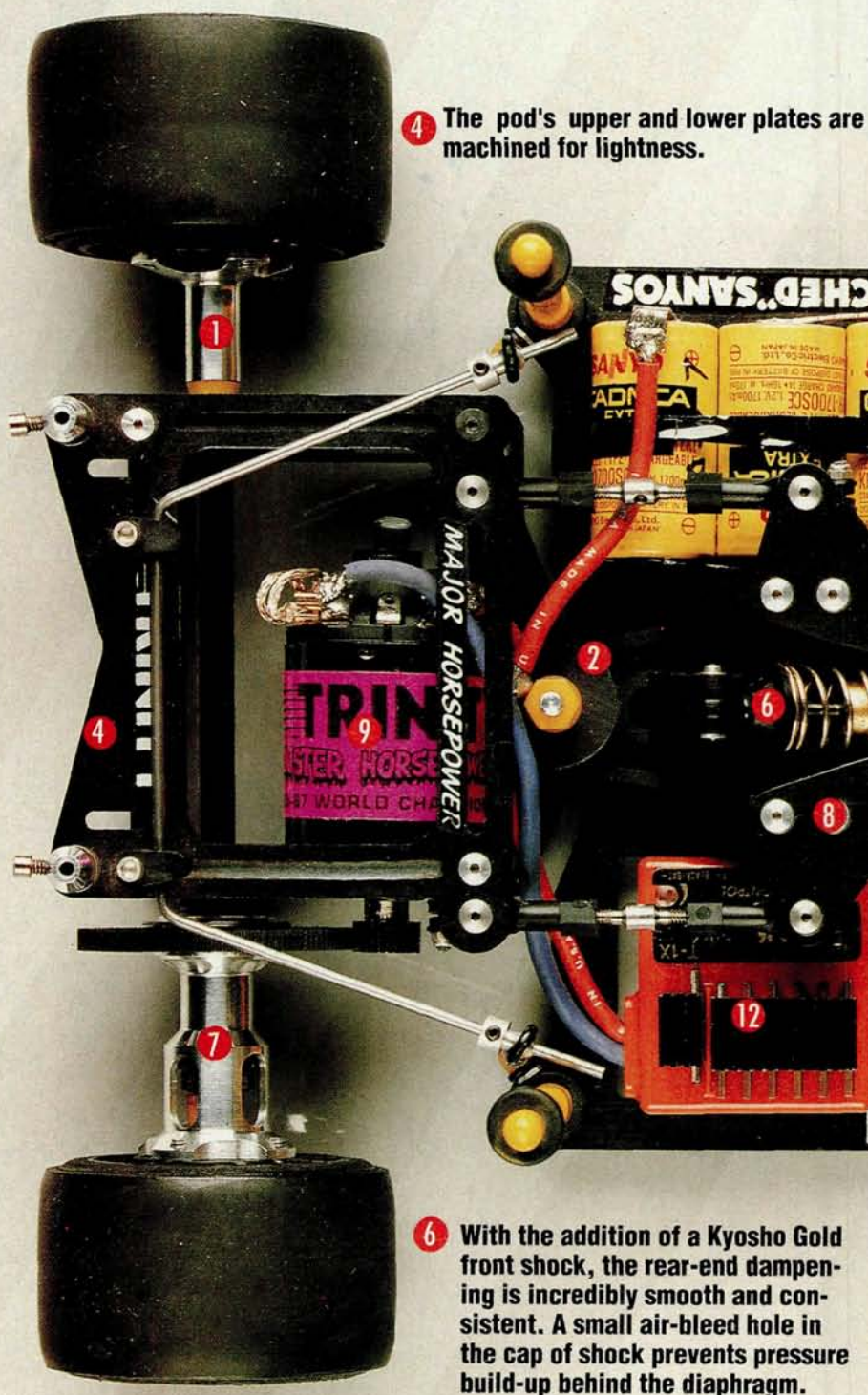
The Lynx II has two axle-mounting locations—one for a shorter wheelbase and one for a longer one. For running at Lake Whippoorwill, Dobson mounted his axle in the forward, longer-wheelbase location.

For the steering, instead of the standard offset axles, there's a set of new steering blocks that are in line with the kingpin. The new axles also have a larger diameter, and this al-

1 The left side hub has also been lightened, and the setscrews have been relocated in the wheel-mounting flange.

2 A small dampener slows the rear end's side-to-side motion.

4 The pod's upper and lower plates are machined for lightness.



6 With the addition of a Kyosho Gold front shock, the rear-end dampening is incredibly smooth and consistent. A small air-bleed hole in the cap of shock prevents pressure build-up behind the diaphragm.

7 To save weight, the sides of the hubs were milled out. This decreased rotational mass but weakened the hubs.

8 The faces of the car's screws have been machined to ensure a flush fit and reduce weight a little.

9 A Trinity, 13-turn, Torkzilla motor provided the horsepower for Dobson's winning runs.



- 3 With a special graphite mount, the weight of the transponder is lowered, so it doesn't affect the car's center of gravity.

- 5 To give ideal weight distribution on an oval track, Trinity Pushed cells are used in a five and one configuration.



- 10 The front axle was cut in half to allow for independent caster adjustments on each wheel.

- 11 The chassis plate is essentially stock, but, to reduce weight, a hole was machined underneath the suspension assembly.

- 12 To increase efficiency, this modified Novak T-1X uses only three wires instead of the usual four.

lows the use of a larger bearing. TRC aluminum tie rods connect these steering blocks to the Futaba* FP-S132S servo. (Dobson's trademark is his Futaba 3LGX twin-stick radio, which he swears he can't drive without.)

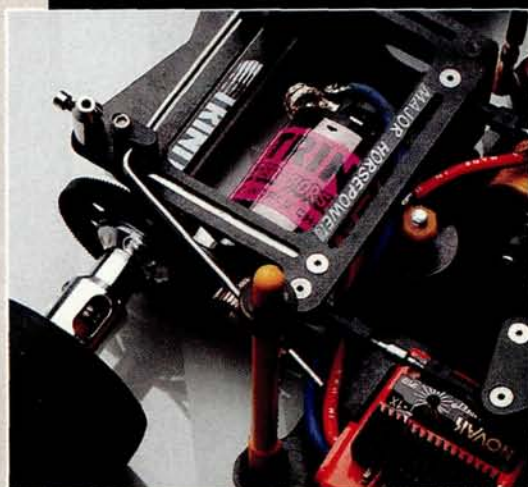
Dobson's car has a graphite transponder mount that keeps the transponder close to the chassis, so the car's center of gravity is lower.

WHAT A SHOCK!

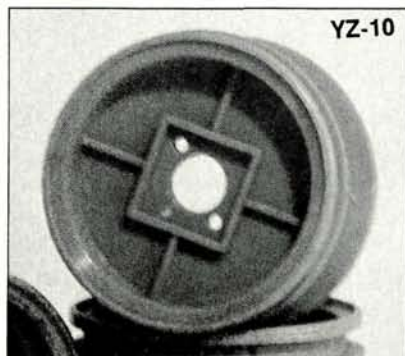
The rest of the electrics? Just behind the steering servo, there's a Novak* NER-2X mini-receiver that's combined with a modified T-1X speed controller. To reduce resistance in the circuitry and keep down weight, the speed controller has been modified: instead of four wires, it has three.

One of the most notable—and, some believe, most beneficial—changes is to the suspension. The stock Delta-type shock was replaced by a Kyosho* Gold short shock. (Yes—an off-road shock!) This Gold shock has full suspension travel for a complete range of rear-pod movement. Four pistons are included with the shock, and for Whippoorwill, Dobson used the one with two notches. He also used Team Losi* 30WT synthetic oil for dampening. The gold spring that's included with the shock kit is the stiffest of the three available.

To ensure enough clearance be-



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- 1455 Kyosho Front Nylon Direct Bolt on Rims.
- 1456 Kyosho Rear Nylon Direct Bolt on Rims.
- 1457 YZ-10 Front Nylon Direct Bolt on Rims.
- 1458 JRX2 Front Nylon Direct Bolt on Rims.
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INSIDE DOBSON'S CAR

tween the shock and the graphite bridge that joins the suspension mounts, Dobson took 1/4 inch off the bottom of the shock mount. On both ends, aluminum pins exactly like the ones used to mount the stock shock secure the Kyosho Gold.

To increase the Lynx II's side-to-side, rear-suspension dampening, there's an extra dampener plate mounted just above the pivot ball on the rear pod. This plate resembles the one used on a T-plate suspension,

where friction slows the motion of the pod.

One of the most notable—and, some believe, most beneficial—changes is to the suspension.

To reduce weight, the upper and lower stock plates on the pod were machined in many places. The

shiny finish on the car's screws was achieved by putting them on a lathe and machining a few thousandths of an inch off their faces (so reducing weight slightly and producing a flush fit).

BANISHING BEEF

The rear axle is a standard Lynx II unit with some "trick" machine work on the wheel-mounting hardware. The wheel-mounting hubs were machined to reduce weight. The diff side hub was notched between the mounting holes and machined in four places through the center of the hub where the thrust bearing is located. On the left hub, the beef where the grub screws are usually located has been machined off. Dobson drilled new grub-screw holes through the wheel-mounting flange; these are at 90 degrees instead of the usual 180. To reduce weight even further, Dobson also took out the material between the wheel-mounting holes. (Although these hubs weigh less than others, they're also very fragile, so I don't recommend these modifications for average racers.)

To complete the diff, there are a Trinity* thin Speed Pro spur gear and pinion and Trinity diff balls. Dobson uses a 25-tooth pinion gear and a 120-tooth spur gear to give a 4.8:1 gear ratio.

Other hardware that gives Dobson the power he needs to stay ahead of the pack are the Trinity, pushed, Sanyo cells and the new Torkzilla 13-turn single motor. This new wind was set up with Trinity's soft-compound, dual-shunt, slotted brush and gold medium springs.

For traction, Dobson uses the TRC T/M radials that were specially made for racing at Lake Whippoorwill. These rubber-compound tires are the same as those you buy at your hobby shop, but on these, the base foam was cut on the inside of the tires to produce a slight "stagger." This helps the car steer to the left—the only way you can go at Lake Whippoorwill if you want to win. The rubber compounds were gold on the rear and inside front and silver on the outside front. To finish the package, Dobson chose a Bolink* '89 T-Bird body and a Bud's* bi-level wing, with its top level removed.

If you're thinking that this is a really nice car, but that you can't get your hands on these parts, you're wrong. Team Triad says that, except for the fragile machined hubs, the modifications will soon be available as options for the Lynx II.

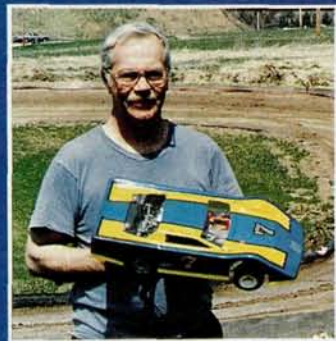
Thanks to Andy Dobson, his machinist Bill Koob and Team Triad for giving us this close-up look at how the pros set up their cars.

**Here are the addresses of the companies mentioned in this article:*

Composite Craft/TRC, P.O. Box 1058, 2211 Charter St.,
Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.
Novak Electronics, Inc., 128-C E. Dyer Rd., Santa Ana, CA 92707.
Kyosho/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.
Team Losi, 1655 E. Mission Blvd., Pomona, CA 91766.
Trinity, 1901 E. Linden Ave., #8, Linden, NJ 07036.
Bolink R/C Cars, Inc., 420 Hosea Rd., Lawrenceville, GA 30245.
Bud's Racing Products, 52435 Route 113, Wakeman, OH 44889.

OVAL-ONLY OPTIMA

SOME PEOPLE LIKE to do things their own way, and David Osterhout of Cobleskill, NY, is one of those people. It would have been much easier to buy a 4WD dirt-oval machine and then go racing, but Dave decided to use his Kyosho Optima Mid as a starting point, and then he came up with something wild!



H

OME-BUILT

P R O J E C T

by RCCA STAFF

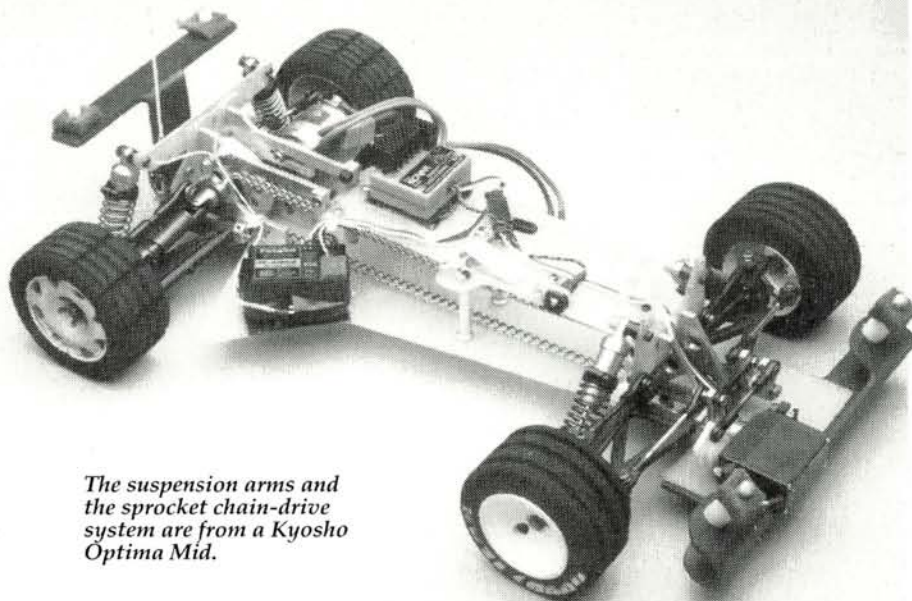
HE DID IT HIS WAY

The car's hand-cut fiberglass chassis has an upper radio plate and shock towers. The chassis is designed for oval racing, and the battery is mounted on the inside or left side so the car can handle left-hand turns. Dave mounted the receiver on a small outcropping on the chassis' right side, and he put the speed controller on the upper radio plate. Some of the

(Continued on page 78)



HOME-BUILT PROJECT



The suspension arms and the sprocket chain-drive system are from a Kyosho Optima Mid.

The project's most intricate parts are the front and rear drive assemblies.

justing tensioner connects the front and rear drive assemblies.

To steer his car, Dave made a drag-link system (like the one used on the Custom Works Dominator) with the servo mounted on the front bumper. For smooth operation and precise control, he used ball bearings. Grooved-foam tires are used on each corner to get the power down and keep the car going straight.

Dave chose a Novak TIX speed controller for modified racing and a Novak T4 for stock, and he uses a Futaba radio system with a Deans two-piece antenna on the chassis.

He used a Custom Works Open Comp Camaro for the body and painted it Candy Blue and fluorescent yellow with black trim. To get the body post as close to the edges of the body as possible, Dave made the front body mount/bumper and rear body mount out of Kydex. The extreme position of the body posts makes the body very stable and resistant to flex.

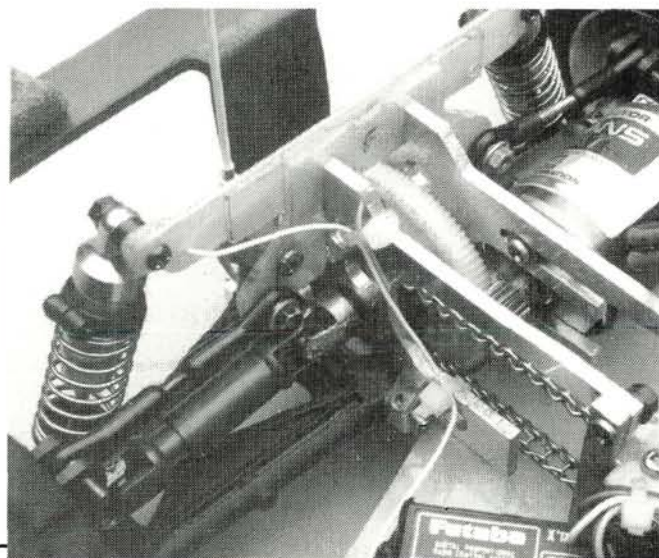
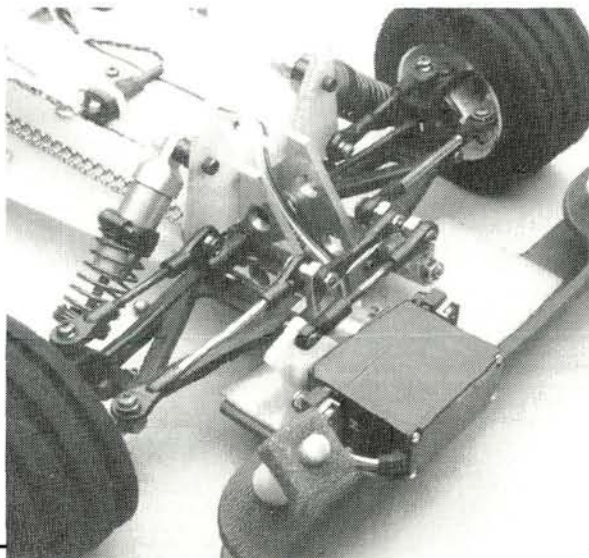
Dave races his 4WD car at the Schoharie County R/C Car Club's 264-foot banked, dirt-oval track, in Warnerville, NY.

Right: The front drive assembly is a custom-machined, direct-drive unit with a Kyosho drive sprocket. Custom Works one-way hubs are used in conjunction with ball bearings and universal shafts.

parts for this oval assailant were handmade; others came from a variety of cars. The suspension arms and the short Gold shocks are from a Kyosho Optima Mid.

The project's most intricate parts are the front and rear drive assemblies. The rear drive assembly features a custom-machined, direct-drive carrier that fits a Robinson Racing spur gear (86-94T 48 pitch) and a Kyosho chain-drive sprocket. Team Losi JR-X2 telescopic drive shafts were adapted to use Kyosho axles, wheels and bearings. The front drive assembly is also a custom-machined, direct-drive unit with a Kyosho chain-drive sprocket. Custom Works one-way hubs, bearings and universal shafts complete the front end, and a chain with a self-ad-

Far right: The rear drive assembly is also custom-machined from an aluminum, direct-drive carrier that fits a Robinson Racing spur gear and a Kyosho drive sprocket. JR-X2 telescopic drive shafts were modified to mate with Kyosho axles, wheels and bearings.



DOG DAY AFTERNOON



Chianelli argues with Pond about the quickest way to loosen tight wheel bearings.



Counter; what a good girl!



The Toyota maintains good flight poise during jumps.

TOYOTA CELICA *GT FOUR*

RALLY RACING IS
GRUELING! It's the
ultimate test of a car's
durability and versatility
and of a driver's reaction
time and composure.

*Rallies usually last sev-
eral days and are divided*

*into stages that involve a variety of terrains. A typical race may start on paved
roads in some center of civilization and then move on to forest paths. The car
might be whipping down a straight stretch over a thick blanket of wet leaves*



by CHRIS CHIANELLI

PHOTOS BY STEVE POND

HIROBO TOYOTA CELICA

Type Rally car
Scale 1/10
Sug. Retail Price
(radio incl.) \$289.99

DIMENSIONS:

Overall Length 17.5 inches
Width 8.88 inches
Height 6.25 inches
Wheelbase 10.25 inches
Track (f/r) 7.88 inches

WEIGHT:

Gross (w/bat.) 4 ounces

BODY:

Type Toyota Celica rally car
Material Polycarbonate

CHASSIS:

Type Pan with upper
beam supports
Material Plastic and aluminum

DRIVE TRAIN:

Primary Pinion/spur
Transmission Gear drive
Differentials Two gear diffs
Bushings Bronze bushings

SUSPENSION:

Type (f/r) Twin A-arm
Dampening (f/r) Metal, oil-filled,
coil-over shocks

WHEELS:

Type (f/r) One-piece plastic
Dimensions (DxW) (f/r) 2 3/16 x 1/8
inches

TIRES:

Front & Rear Rubber, off-road
mud tread

ELECTRICS:

Motor 05/540
Battery 6-cell stick
Speed Controller Mechanical
3-speed forward
w/reverse

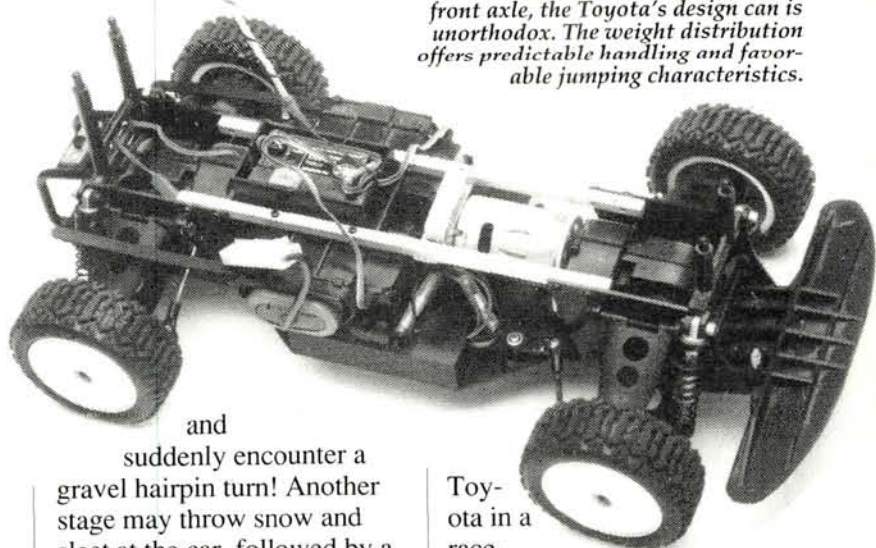
OPTIONS AS TESTED:

None.

COMMENTS:

The car is neutral, with a comfortable understeer. It handles jumps well, and the rear end lands slightly lower than the front. The tight drive train cut run time substantially, and the tight steering linkage caused sluggish steering. If you take the time to address both problems, the Toyota Celica could be a fun back-yard bomber.

With the battery just in front of the rear axle and the motor just aft of the front axle, the Toyota's design can be unorthodox. The weight distribution offers predictable handling and favorable jumping characteristics.



and suddenly encounter a gravel hairpin turn! Another stage may throw snow and sleet at the car, followed by a trip back through town and a muddy hill climb...you get the idea. Both car and driver must continually adapt to the changing conditions.

With that in mind, Hirobo* has unleashed the Toyota Celica GT Four, which really excited my R/C squir-

Toyota in a race-ready package that includes a JR Beat 2 twin-stick radio, a peak-charger and a 6-cell flat pack. Just apply the decals and buy AA dry-cells for the transmitter, and you're ready to go!

... this 4WD rally car is intended to run on pavement, dirt, grass—and anything else!

rel sense of smell! With its mid/front motor location, this 1/10-scale, ready-to-run, 4WD rally car is intended to run on pavement, dirt, grass and anything else!—just like the full-scale cars. Hirobo, which also manufactures the 4WD Invader, offers the

IT'S IN THERE!

The Toyota has upper and lower A-arms all around, with adjustable oil-filled coil-overs. The molded-plastic pan chassis is strengthened by two aluminum beams that run its length, spanning the front and rear diffs and connected at their tops. The feature that makes the

Toyota unique is its in-line motor that drives the front diff, while power is transferred to the

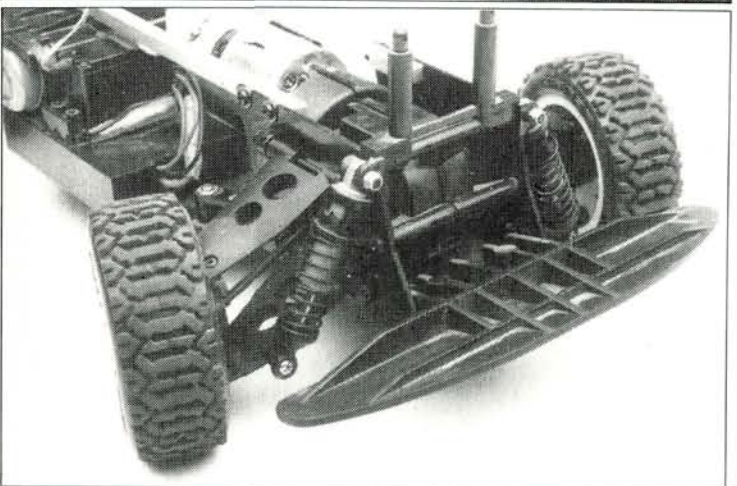
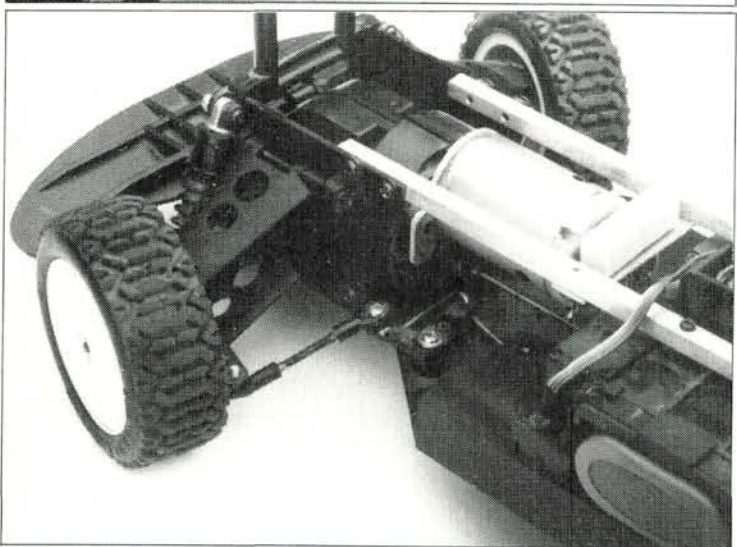
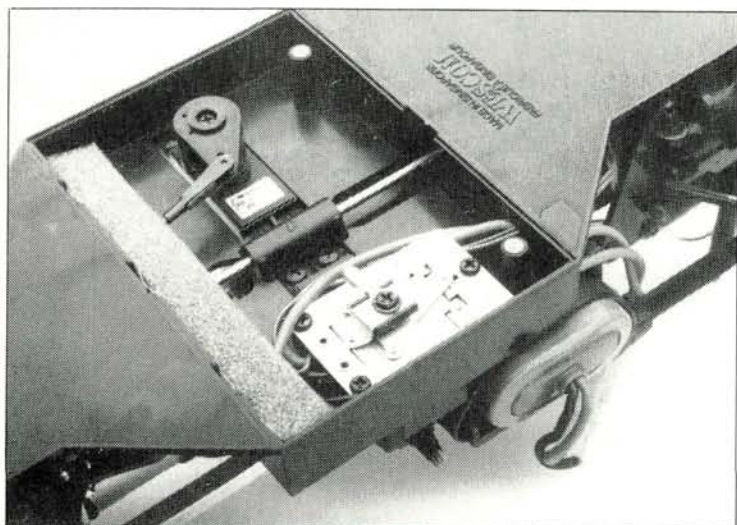


The Toyota Rally comes with a JR Beat 2 radio, which can be used in other cars as well. The package also comes with a peak charger.

TOYOTA CELICA

GT FOUR

"...the Toyota Celica could be
a great beginners' car..."



Top: The mechanical step speed controller and steering servo are well-protected from dirt. Note drive-shaft at center. Middle: The Mabuchi 540 drives a front-diff spur gear. A more potent stock motor would look nice in the "scale" motor position. Bottom: Upper and lower A-arms and oil-filled coil-overs are found all around.

rear by means of a shaft. This design deviation gives handling that novices will welcome.

With the battery located 3 1/2 inches forward of the rear axle, and the motor 2 3/4 inches back from the front one, the Toyota is well-balanced and handles predictably; it exhibits a comfortable touch of understeer. This weight distribution keeps the nose up during jumps (something other 4WD cars have a problem with). Nosing-in costs time and is hard on front-suspension components.

YOU GOT A PROBLEM?!

Unfortunately, I have some bad news about the Toyota. The drive train was tight, as was the fit of two of the axle bushings—so tight that what should have been an 8- to 10-minute run on a fully charged battery pack lasted barely 5 minutes! This could be fixed by disassembling the car and working in the bushings with jewelers' paste, or by replacing them with ball bearings, but the drag doesn't stop there. The front steering linkage was also very tight, and this makes response sluggish. Steve Pond and I managed to free things enough to realize some of this car's handling capabilities, but I don't think a beginner who buys a ready-to-run car should have to take it apart and put it back together to get proper performance. That's why I didn't open the car to explore its innards.

Hobby Dynamics (the distributor) told me that they haven't run into this problem or experienced it with other

Toytas. They assured me that complete parts back-up is in place; that's good, because I broke a shock mount on a lower rear A-arm. Breakage is common with our test cars, owing to the merciless torture that we inflict on them under the decree of the sadistic Ayatollah!

While the Toyota doesn't have the footprint or the suspension travel for serious off-road competition (being modeled after the full-scale rally car), it deserves attention. I think offering it in kit form would be appropriate, although Hirobo should continue to sell it as a ready-to-run, too.

RISKIN' IT

Hirobo has taken some design chances with the Toyota, and, despite the aforementioned problems, these deviations from the norm show promise. Very forgiving handling and jumping traits, combined with one of the best scale bodies around, make the Toyota Celica GT Four a very interesting car. Although we ran it on a dusty off-road surface for the photo session, it would probably work better on hard-packed or paved surfaces, where dirt wouldn't cause binding in the suspension system so quickly. Despite its limitations, the Toyota Celica could be a great beginners' car, as long as you're ready to take the time to ensure that everything moves freely.

*Here's the address of the company featured in this article:
Hirobo, distributed by Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

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In keeping with our constant efforts to help foster the growth of the radio-control car hobby, we print this track directory intermittently to inform modelers where they can race and exchange ideas. If you'd like your track listed, send the track's name, address and phone number to R/C Car Action Track Directory, 251 Danbury Road, Wilton, CT 06897. We'll list as many clubs as space allows.

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Robin Byrom (205) 435-5576

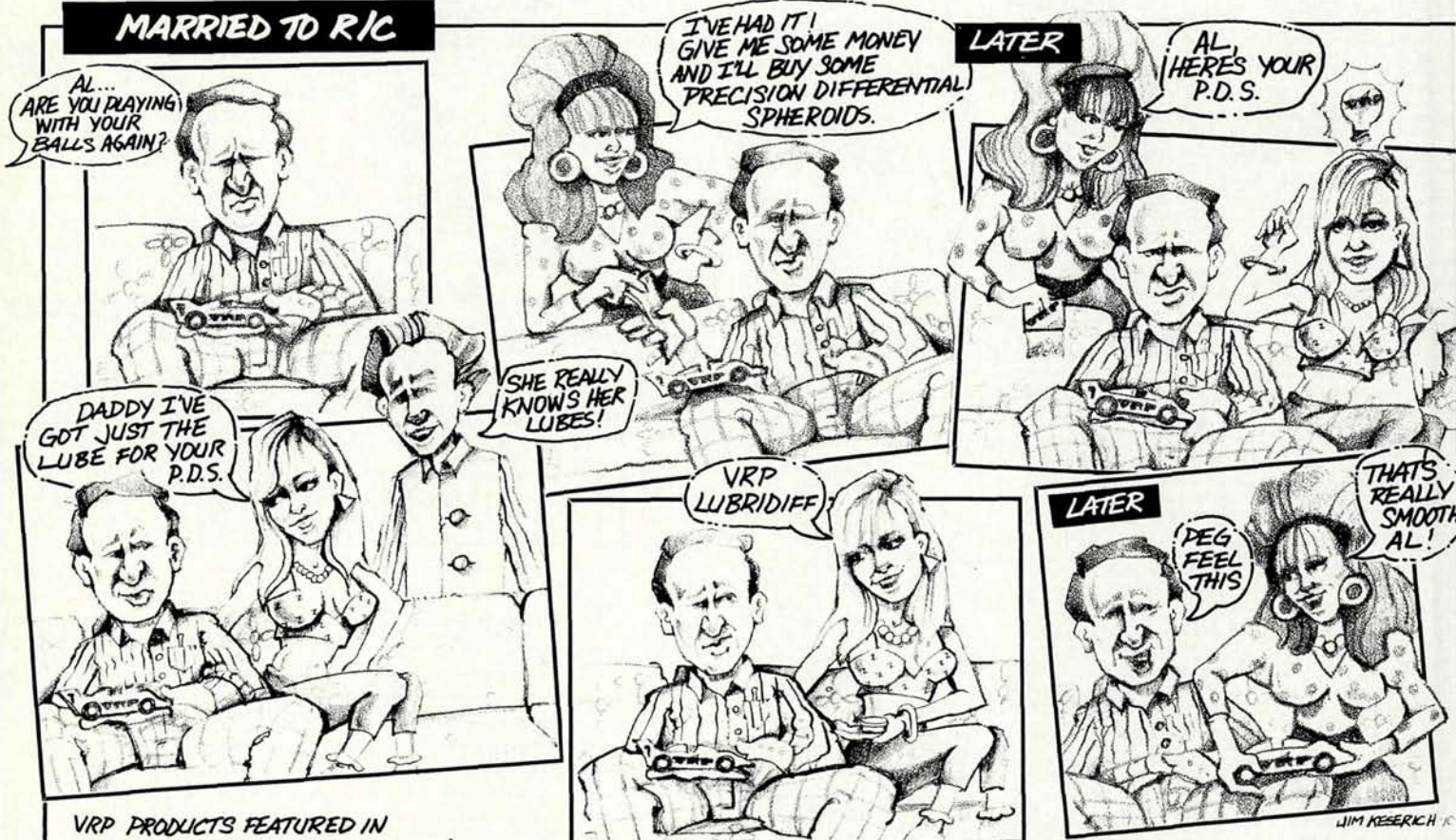
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(Continued on page 98)

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TRACK REPORT



M A X T R A X W E D G E

by BILL O'BRIEN

CERTAIN RADICAL SEGMENTS of the R/C community are twisting, bending and mutilating their monster trucks into heavy haulers. Hobbico's* offering to these mad dogs is the new Max Trax Wedge.

WEDGE



Even though the current crop of R/C trucks is better equipped to crush, kill and destroy than ever before, few monster trucks can stand up to a pulling sled. When it comes to yanking a weighted sled over 30 feet of dirt or high-traction carpet, they simply aren't designed to tug, pull and sweat. The Max Trax Wedge is one of a new breed of monsters—the muscle trucks—whose sole function is to grin and bear it as they drag some serious weight behind them.

ON THE LEADING WEDGE

The Max Trax Wedge arrives as sort of a semi-kit...almost. It's a very simple vehicle with no suspension at all—just a channeled metal chassis, a gearbox filled with plenty of "tuff stuff" and two pairs of wheels. If you're a hard-core builder like me, you'll hate Hobbico's designers: they've taken all of the fun out of the Wedge because they've hunted around for compatible parts and done 80 percent of the work needed to make them fit together.

For example, the front wheels and tires are from an MRP* 2WD off-road car kit; the rear wheels and tires are from

Kyosho's* monster truck series; the differential came from an electric kiddy car and was drilled out to fit an R/C electric motor. The stretched chassis is custom-designed to fit all these parts comfortably, and the rear wheels are also custom-drilled so that they'll mount correctly on the humungous steel axle.

I received one of the first available kits, and the designers hadn't yet made decisions about a few of the components that you might expect to find in a kit, e.g., body-mounting posts. There weren't any—but then, there wasn't a body, either. Also not included are: steering rods, a steering bellcrank, antenna mounts and any way to mount a servo, a receiver, or a speed controller.

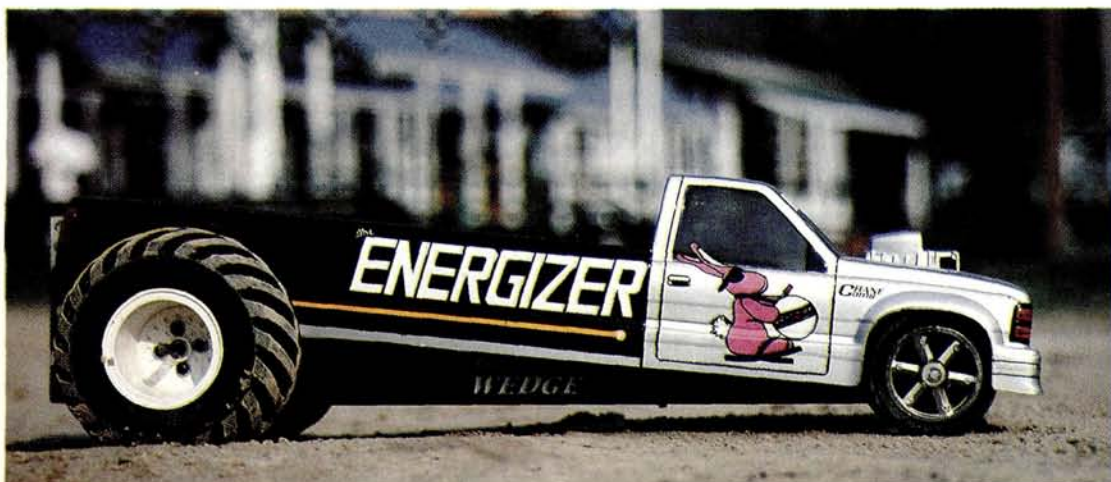
H A U

ELIMINATOR SLED-UCATION

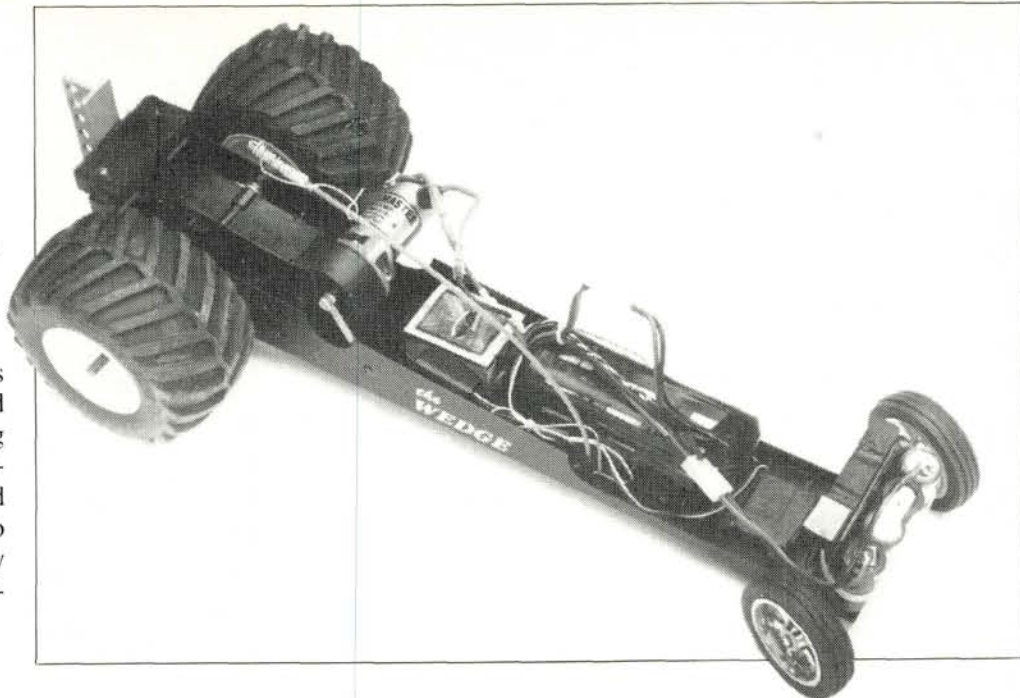


WEDGING IT IN

Putting the parts together is a snap...almost. The rear wheels are easily bolted together and clamped to the rear axle. The front wheels are mounted on heavy-duty axles that ride on kingpins, which are plugged into a fiberglass cross-member. There's a plethora of possible mounting positions for the front end to accommodate an equally wide variety of wheelbases, but don't tack on the front end just yet.

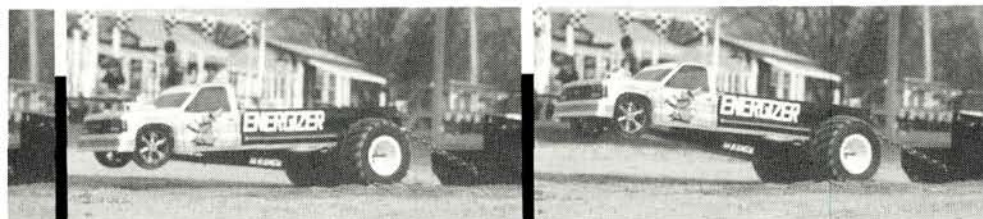


To tackle the steering, I reached into my magic bag of tricks and came up with 4-40 rods and some rod ends. They're coupled to the servo through a Kimbrough* servo-saver, and the servo is attached to the chassis with double-sided tape (but don't do that yet). My crowning achievement was the addition of a Hi-robo* antenna mount from an Alien Mid (although you really don't have to do more than tuck the antenna under the body for the 30 feet that a pulling truck travels).



The chassis can be called an aluminum stretched tub. A PDI Zeta Turbo speed controller was used, as were Big Brute wheels and tires.

N M A S S



It's difficult to test pulling trucks if you don't have the equipment to challenge them. You need a pulling sled, and to test the Wedge, I bought a Max Trax Eliminator sled from Hobico. There are only three words I can use to describe that sled: Oh my gosh!

It has 1/4-inch dual axles, all-metal construction and a three-chain weight-box delivery system that would do a 10-speed racing bike proud. Best of all, the frame is rated at 400 pounds. The

weight-box travel is as smooth as silk, even with Oilite bushings, and, despite the fact that it arrives as a kit, three hours of intense attention will put a working sled in your hands.

The most difficult parts of the assembly are the tires and wheels. Out of the box, they don't go together well at all. Soak the tires in some hot water (not boiling), soap the rims to add some lubrication, and you won't need more than a screwdriver, four hands

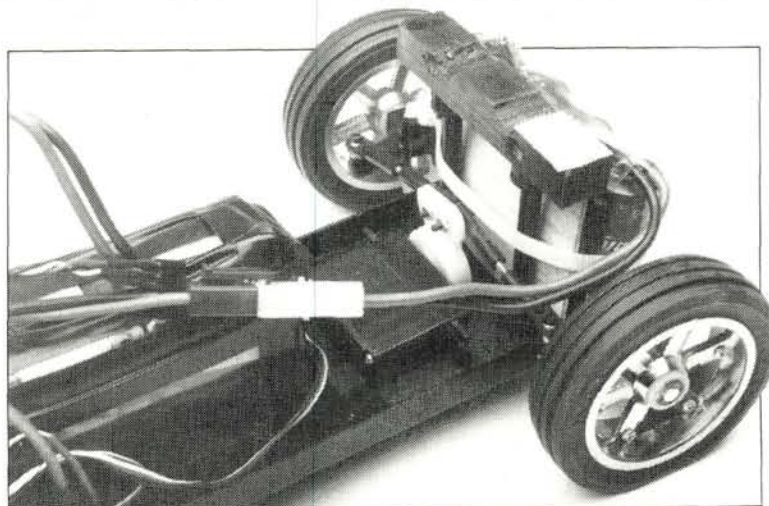
and about five minutes per wheel to mount the tires. After that, just put down the sled and fill the weight basket—the rest is up to your truck.

Its construction commands a \$300+ price tag, but the Eliminator is well within the range of most clubs, and it could be a great group purchase (you can even raise revenues by renting it out). I have an Aristo-Craft* Draggin' Wagon and it's great for stock pulling, but its performance comes nowhere near that of the Eliminator. This sled is one of those devices that immediately respond to the words "get serious!"

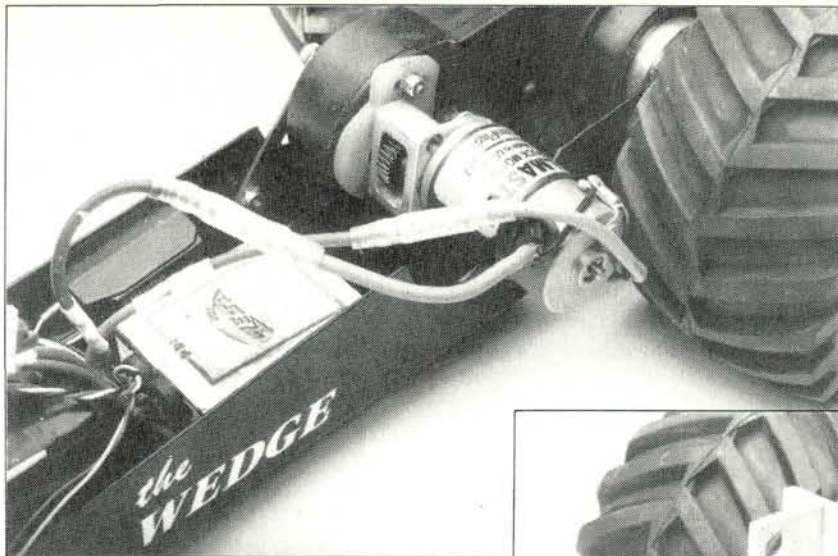
BILL & BART & THE BODACIOUS BUNNY

I sent a Parma* long-bed Chevy truck body to wild Bill Henning* for a dose of color. As you can tell from the photos, he didn't hold back: the Energizer motif and that bodacious bunny are incredibly well done, and a somewhat unsympathetic Bart Simpson bringing up the rear.

Mounting the body was the most complicated procedure. Parma has done a stupendous job of creating this stretched-bed truck, but it wasn't designed for a specific chassis, so you have to play with it a little, which I love to do.



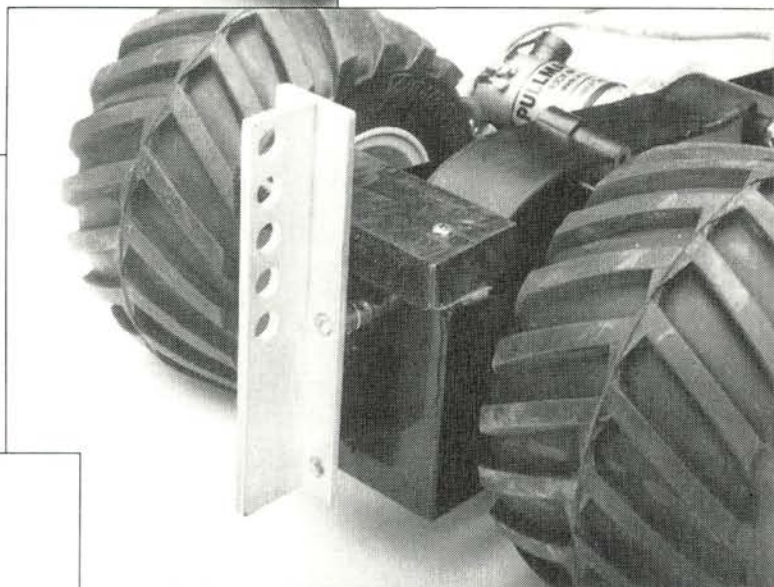
The Max Trax Wedge uses MRP Stage II front wheels and rims. Four Graupner cells, forward of the front axle, supply reverse power.



Astro Flight's PullMaster is linked to a Black Magic gear-reduction unit. The truck can also be set up competitively without the reduction unit.

The attachment points for the front suspension provided a wheelbase that was too short for the body. Usually, that isn't a problem, because you can just hack off some of the rear of the bed to make it fit...but there was Bart Simpson, staring out at me from the tailgate. I just couldn't

The hitch is made of 1/8-inch aluminum and has five hook-up points.



The Hobbico Max Trax Eliminator sled is made of heavy-duty aluminum with a one-piece, extruded and machined aluminum frame.

one to tell you to do that.

Controlling it all is a PDI* Turbo Zeta speed controller. It isn't just any PDI speed controller: this was the one that nearly melted John Rist's lab—the one that will handle more cells than most battery chargers can refill—a 32-cell-maximum, amp-swallowing monster with separate forward and reverse batteries! If you need one, don't worry about the two bills it will cost you, because only two things will survive a nuclear war: cockroaches and this speed controller.

MR. BILL GETS THE WEDGE

I set up this Wedge to run on a carpet track and brought it to the *Car Action* offices for The Pond to work his camera magic—and what do they do to me?!—they run it on loose dirt! Oh no, Mr. Bill! On carpet, you need stiff tires and slow ground speed; on dirt, you need soft tires and fast ground speed. For optimum results, you really need packed earth.

You can guess the rest. We had to make a swift change in the reduction gearing, and even so, the Wedge was hampered by the improper setup. It managed to drag a 35-pound concrete slab along a full, 30-foot pull and did it handily, but that's just barely scratching the surface of what the truck could do if it were set up correctly

cut him out of the picture.

Using the fiberglass cross-member as a template, I aligned it so that the leading edge of the cross-member was approximately 1mm from the leading edge of the chassis, and then I marked the appropriate holes. After about 30 seconds of drilling and a little filing to get rid of the flashing, I had a Max Trax Wedge with a 17-inch wheelbase. (The maximum length for 2WD modified is 24 inches, including hitch.)

Using Bolink* body-mounting posts, I trial-fit the body, drew the cutouts for the rear wheels and did some Lexan surgery. Rather than cut holes in the body for the body posts, I mounted wooden blocks on

the posts and applied Velcro in generous doses. For the rear, I attached two wooden blocks to the rear wall of the chassis; they grab the inside rear edge of the tailgate.

POWER PLAYS

Power is very important, and I was judicious in my selections. I paired a Team Astro* PullMaster motor and a Black Magic* 2:1 gear-reduction unit before attaching the whole assembly to the Wedge's gearbox. To give the motor a little kick, I wired up 12 Sanyo* SCR sub-C cells. (Fourteen cells are maximum for the class, but the motor has a 12-cell limit.) The PullMaster can probably withstand 14 or more cells, but I won't be the

MAX TRAX

WEDGE

Type2WD sled puller
Scale1/10
Sug. Retail Price\$299.95

DIMENSIONS:

Overall Length23 inches
Width9.812 inches
Height6 inches
Wheelbase17 inches
Front Track6.25 inches
Rear Track9.625 inches

WEIGHT:

Gross (w/bat.)7 pounds, 2 ounces

BODY:

TypeParma Chevy Fleetside Puller
MaterialPolycarbonate

CHASSIS:

TypeChannel
MaterialSteel

DRIVE TRAIN:

PrimaryGear
TransmissionGear reduction
DifferentialNone
Bearings ..Ball bearings/Plastic bushings

SUSPENSION:

Front/RearNone

WHEELS:

Front: TypeTwo-piece plastic
Dimensions (DxW) ...2x⁹/₁₆ inches
Rear: TypeThree-piece plastic
Dimensions (DxW) ...2⁵/₁₆x2¹¹/₁₆ inches

TIRES:

FrontRibbed
RearTerra treads

ELECTRICS:

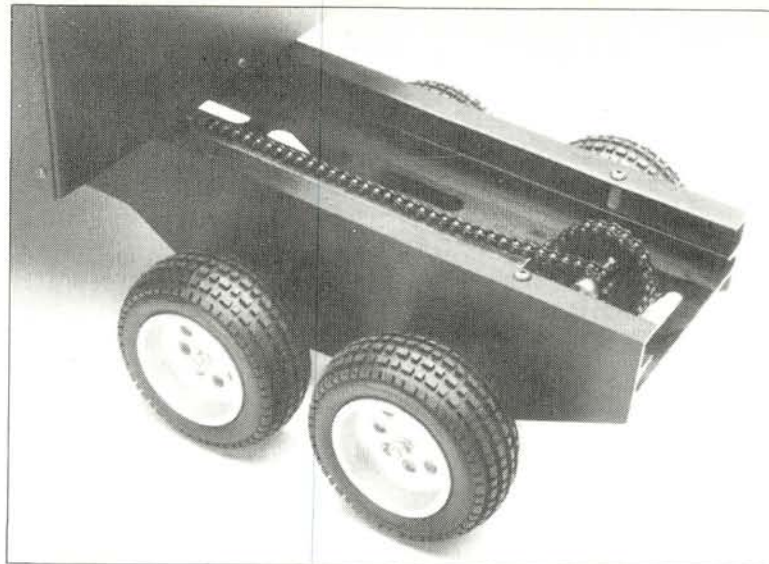
Motor05
Battery12-cell stick
Speed ControllerElectronic

OPTIONS AS TESTED:

.PDI Turbo Zeta; Aristo-Craft radio; Futaba R102H mini-receiver and S-148 servo; Astro Flight PullMaster motor; Parma Chevy Fleetside Puller body.

COMMENTS:

If you want get into competitive sled pulling without the hassle of scratch-building, take a look at the Max Trax Wedge. This semi-kit will save you a lot of time and probably money, because Max Trax has ferreted out all the specialized parts (e.g., the long, metal, tub chassis). The holes in the supplied hitch are too high to be NR/CTPA-legal. This can be remedied by turning the entire hitch over and drilling new mounting holes, or by drilling new hitch holes below the existing ones.

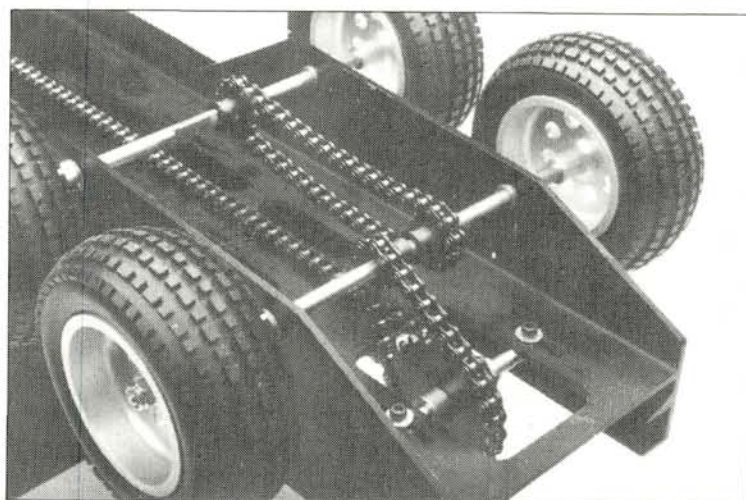


The front and rear axles both drive the weight-box chain system. The wheels are aluminum, and the tires are solid rubber.

for the track conditions. Under the proper conditions on a well-prepared track, the Wedge has pulled over 100 pounds on dirt and over 200 pounds on carpet. The weight pulled should be the least of your concerns, however. In sled pulling, the object is to pull a given weight farther than

Sure, you can scratch-build your own truck, and you can modify a truck you already own, but on a simple dollars-for-doughnuts kind of rating, you won't come near the Wedge's potential, and you'll probably spend more, anyway. It's a great addition to Hobbico's Max Trax line—

The chain-and-sprocket winch system has stainless-steel axles and Oilite bushings. This official NR/CTPA sled is rated for 400 pounds.



any other truck: you're not competing against the sled; you're competing against other pullers. Many variables determine the amount of weight you pull, so just concern yourself with whether your setup will prevail over the other pullers and if your puller is durable enough to reach the heavy-weight zone.

WHAT'S NEXT

Hey, so what did I prove? I proved that truck pulling isn't just mindlessly tying a truck to dead weight: it's an art form, and the truck really must be tuned to the surface on which it runs. The Wedge has great potential, and there's more than enough room to let me find out just what it can do. (I doubt that anything will shatter the Wedge's gearbox; after all, it was designed to withstand the onslaught of—gasp!—children.)

and an excellent addition to my garage.

**Here are the addresses of the companies mentioned in this article:*

Hobbico/Great Planes, P.O. Box 4021, Champaign, IL 61820.

MRP, 18676 142nd Ave. NE, Woodinville, WA 98072.

Parma International, 13927 Progress Pkwy., North Royalton, OH 44133.

Henning Scale Models, 128 S. Line St., Lansdale, PA 19446.

Kimbrough Products, 1430 East St. Andrews Place, Unit F, Santa Ana, CA 92705.

Hirobo; distributed by Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

Bolink R/C Cars, 420 Hosea Rd., Lawrenceville, GA 30245.

Team Astro, 13311 Beach Ave., Marina del Rey, CA 90292.

Black Magic, 604 South Grand Ave., Fowlerville, MI 48836.

Sanyo, Battery Division, 200 Riser Rd., Little Ferry, NJ 07643.

PDI, 16922 NE 124th St., Redmond, WA 98052.

Aristo-Craft/Polk's, 346 Bergen Ave., Jersey City, NJ 07304.

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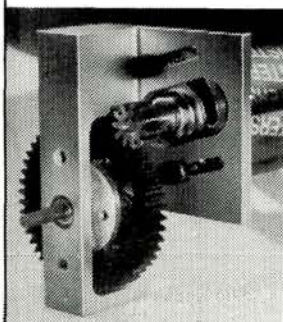
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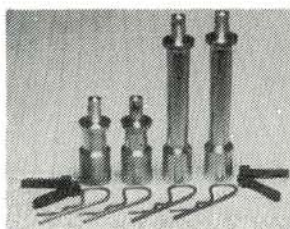
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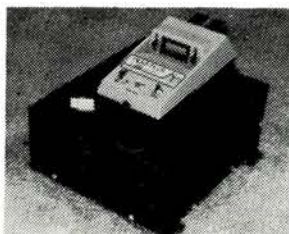
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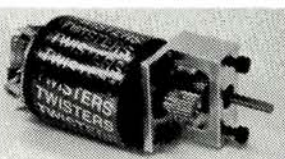
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(Continued from page 86)

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(Continued on page 110)



T A M Y I A

THUNDER DRAGON QD

by WALLY DAVID



TAKE A lot of abuse about being an R/C snob. You see, the only entry-level car I've reviewed was the Panda Stocker, and the editors constantly remind me about all the high-end, whizz-bang, all-out race cars that

have fallen into my big sweaty mitts. Of course, that is one of the benefits of toiling at the home office, where all the goodies enter our system.

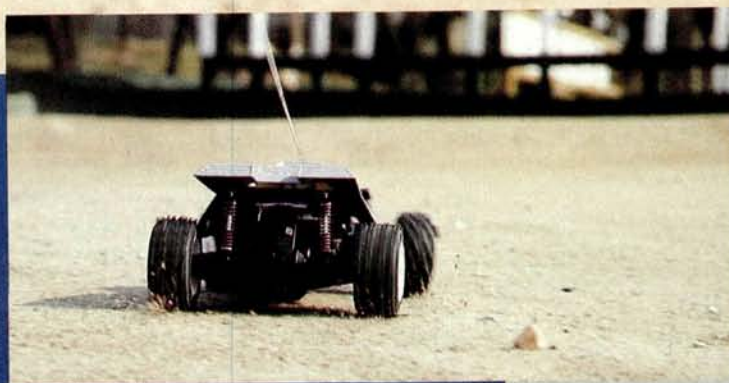
When a smaller-than-usual box arrived,

LIZARD POWER



PHOTOS BY STEVE POND

opened it with some puzzlement. As I slid its contents out onto the office floor (after I had cleared a space!), I was confronted by the Tamiya Thunder Dragon QD from MRC*.



TAMIYA THUNDER DRAGON QD

Type Off-road
Scale 1/14
Sug. Retail Price \$139.95

DIMENSIONS:

Overall Length 12.25 inches
Width 7 inches
Height 4.5 inches
Wheelbase 8.25 inches
Track (f/r) 6 inches

WEIGHT:

Gross (w/bat.) 1 pound,
12 ounces

BODY:

Type Single-seater off-road
Material Plastic

CHASSIS:

Type Tub
Material Plastic

DRIVE TRAIN:

Primary Pinion/spur
Transmission Gear drive
Differential Gear
Bearings/Bushings Bushings

SUSPENSION:

Front: Type Independent
lower A-arm
Dampening None
Rear: Type Floating axle
Dampening None

WHEELS:

Front: Type One-piece plastic
Dimensions (DxW) 1.69x1
inches
Rear: Type One-piece plastic
Dimensions (DxW) 1.69x1.19
inches

TIRES:

Front/Rear Pin-spoke

ELECTRICS:

Motor RS-380
Battery 8 AA cells
Speed Controller Electronic

OPTIONS AS TESTED:

None.

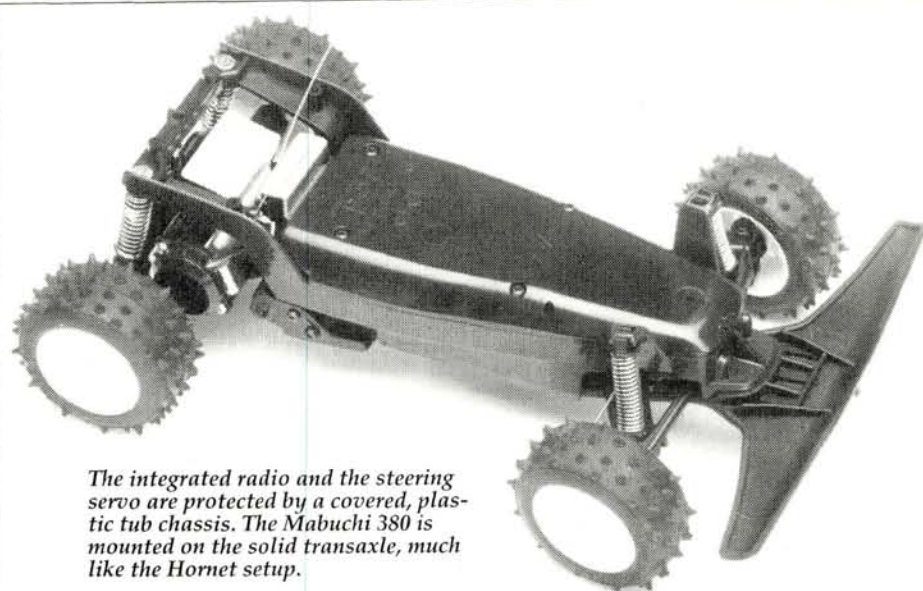
COMMENTS:

Although the Dragon is purely a "fun" machine, its fully proportional steering elevates it above toy status. For its size, the car handles well on fairly smooth surfaces, but it loses its cool on larger bumps (owing, in part, to the absence of shocks). A set of rechargeable AAs and a charger are readily available and will save you lots of money if you plan to use the car a lot.

THUNDER DRAGON QD

THIS IS NOT A TOY

At home, I immediately noticed the warning on the box: "This is not a toy." Most R/C



The integrated radio and the steering servo are protected by a covered, plastic tub chassis. The Mabuchi 380 is mounted on the solid transaxle, much like the Hornet setup.

cars sold at toy stores are just that—toys. You run them around for a while, something breaks, and—frustrated—you toss a pile of plastic into the corner.

Tamiya has done something to nurture the budding R/Cers; they're the ones who just might get into the hobby if they aren't disenchanted with their first experience, and with this car, they won't be.

OPEN SAYS ME!

If you have any questions about what the "QD" in "Thunder Dragon QD" stands for, as soon as you open the box, you'll know. It means Quick Drive, as in getting the car going in no time.

Anyone who knows the Tamiya Hornet will notice a marked similarity between that venerable entry-level car

and this little 1/14-scaler. The front end features an A-arm suspension, although there's no upper control link. Because there isn't much suspension travel, camber changes aren't a problem. Dampening is accomplished by tiny friction spring shocks, and a sturdy bumper protects the front end.

The rear end looks astonishingly like a Hornet rear—a live rear axle, a sealed gearbox and friction spring shocks. Plastic bushings handle the chores at the friction points of the front and rear axles, to which one-piece wheels and semipneumatic spiked tires are mounted.

The front and rear ends are mated to an ABS plastic monocoque chassis that has a bolt-on dust cover to protect the radio gear. The Thunder Dragon QD comes with a little

THUNDER DRAGON QD

pistol-grip radio that has steering-trim adjustment. Nestled in the chassis, under the dust cover, a steering servo with a servo-saver is connected to a combination receiver/electronic speed controller. The Thunder Dragon has proportional forward and reverse, as well as proportional left and right steering. And, unlike most small-scale, inexpensive, ready-to-run cars, the 27MHz radio crystals can be changed if you have frequency problems.

A sharp-looking, impact-



resistant, injection-molded body caps off the QD, and the decals are already applied for you.

DRIVING MISS DRAGON

With eight AA batteries installed for propulsion, and a 9V transistor battery in the transmitter, the TD's first test was a run on a driveway. The car was very responsive and had plenty of speed for buzzing around the driveway, so it would be very exciting for any inexperienced R/Cer. The proportional steering was way beyond that of any "toy" car I've seen, and the knobby tires showed no signs of wear. (This is good news, because I have a feeling that this car will see a lot of run time!)

Unfortunately, the weather was overcast, so I couldn't take pictures. For the photo session, we took the Thunder Dragon QD to RC World's off-road track in Danbury, CT. You won't win the World Champs with the QD, but that wasn't its manufacturer's intention. Its spiked tires give it plenty of traction, but it bounced quite a lot over the roughest parts of the track.

I strongly suggest that you use rechargeable AA batteries. They provide an increased voltage that will give you even better performance, and you won't have to spend a fortune on alkaline batteries!

OOPS!—SOMETHING'S MISSING

As I sat down to write this Track Report, I decided to check out the instruction manual. "What," you say! "He didn't look at the instructions

before he ran the car?" I admit it. I'm an experienced R/Cer, and this is a ready-to-run car, so I didn't think the instruction book contained anything of vital importance for me. In truth, there wasn't, but inside the warranty card that was under the manual, I found another sheet of decals that would have added more details. That's why you won't see these decals in the photographs.

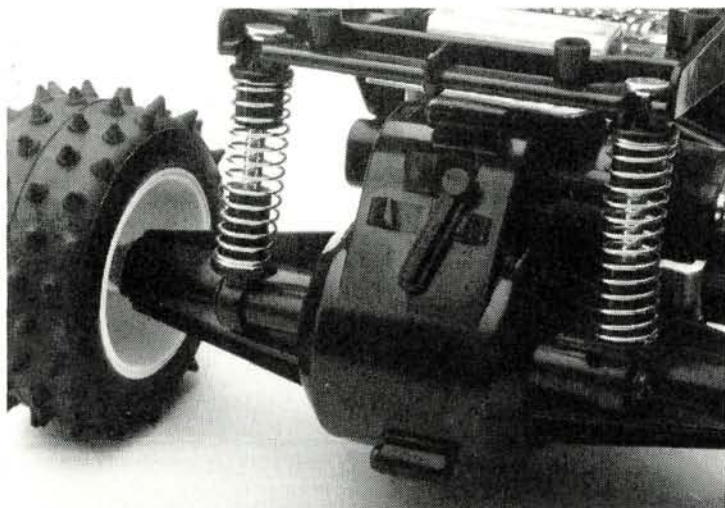
In the instruction manual, I found valuable tips on maintenance and guidelines for operating the QD safely. I also found out about a little switch that I hadn't noticed on the back of the gearbox; it's the "turbo" switch. The "H" (turbo) mode is great for high speeds on smooth surfaces, and the "L" (normal) mode is for rough surfaces. (The turbo mode gives less run time than the normal mode.) As usual, the moral of this story is, "Read the instructions first!"

THEY'VE DONE THE RIGHT THING

Tamiya has really done the right thing with its QD line of beginners' cars. They provide a way to get into R/C for next to nothing, and with the optional ball bearings, tires and wheels, you can hop-up your car as you gain experience.

The availability of high-quality vehicles like the Thunder Dragon, means that no newcomer will be disenchanting with this hobby. Happy beginners will probably become dyed-in-the-wool R/Cers. My hat's off to Tamiya.

**Here's the address of the company featured in this article:*
Tamiya/MRC, 200 Carter Dr., P.O. Box 267, Edison, NJ 08818. ■



Top: The Dragon has friction coil springs all around. The switch on the diff case selects high (fast) and low (economy) modes. Bottom: Lower access door for eight AA cells allows easy replacement. Rechargeables are recommended; using dry cells can become expensive.

BATTERY DUMPING



TO KEEP YOUR PACKS IN GOOD SHAPE, SEND 'EM TO "THE DUMPSTER!"

by STEVE POND



BATTERY maintenance is probably the hottest topic in R/C! Sure, there's a lot of "bench racing" about which car, radio, speed controller, or motor is the best, but nothing causes more controversy than the batteries we use to power our prized possessions.

There are no absolutes when it comes to battery charging, cell matching, pushing, or discharging. Experienced racers do a lot of experimenting before settling on what's best for their "killer packs." If you surveyed the top pros in R/C racing, chances are you'd hear as many theories on how to care for them as there are types of batteries!

One recent trend is to push cells to ensure maximum performance and to match them at a discharge rate that's closer to the actual loads encountered during a race. This charging method doesn't differ much from previous ones, but there's a lot of debate over how battery cells should be discharged.

Even after you remove a pack from your car or truck because it

has slowed down or stopped, a residual charge might remain; this charge must be used up to protect your batteries from the "memory effect." After repeated cycles in which a pack isn't completely discharged, it will begin to lose a

disproportionate amount of voltage when run beyond the point from which it was charged last. Unfortunately, you don't always have time to run your car until the battery is dead, so you should use a device to run out the remaining charge.

There are many ways to deplete a pack, and it's funny to see what some racers are using. I've seen everything from a 5-ohm $\frac{1}{4}$ W resistor to a 100W halogen headlight used for discharging. Whatever method you choose, most people agree that the battery should be dumped at approximately the same rate as it would be used in a car being run under race conditions: for $\frac{1}{10}$ -scale on- and off-road, between 20 and 30 amps; for $\frac{1}{12}$ -scale 8-minute racing, approximately 10 to 15 amps.

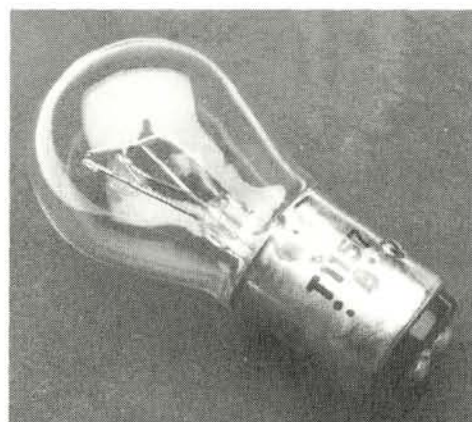
Some of the more popular dischargers can discharge at these



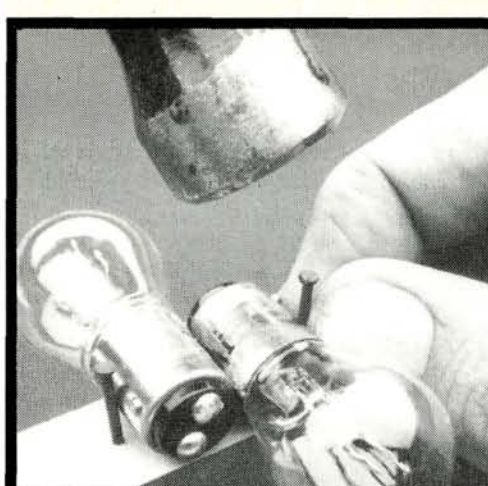
The Dumpster is an excellent, inexpensive discharger.



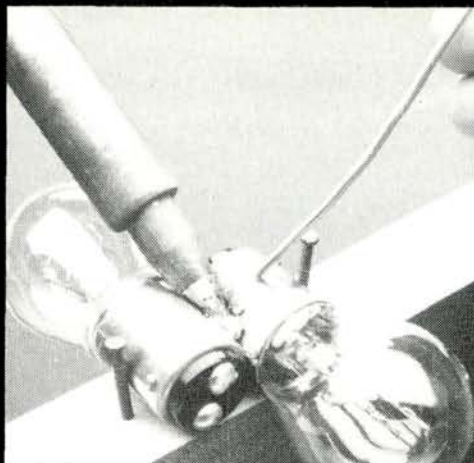
Radio Shack's 2-inch alligator clips are heavy enough to handle high current loads. They're inexpensive and easy to replace.



This standard no. 1157 automobile taillight is ideal for discharging Ni-Cd batteries. No. 1156 bulbs have a single element but cost about twice as much.



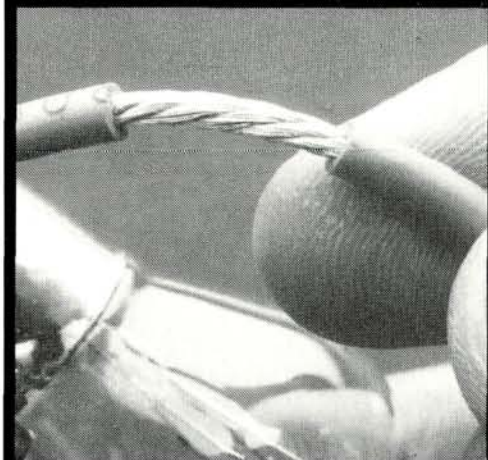
1. Use finishing nails to hold the first two bulbs together on the edge of a board. They'll free your hands for soldering.



2. A hot soldering iron (e.g., the Ungar Race Station) is required to heat the bulbs enough for the solder to flow. Solder the brass portions of the bulbs together, flip the assembly over and do the same on the other side.



3. This is how the assembly should look when all the bulbs have been soldered together. Note the angle of the contacts; it makes it easier to wrap the positive wires.



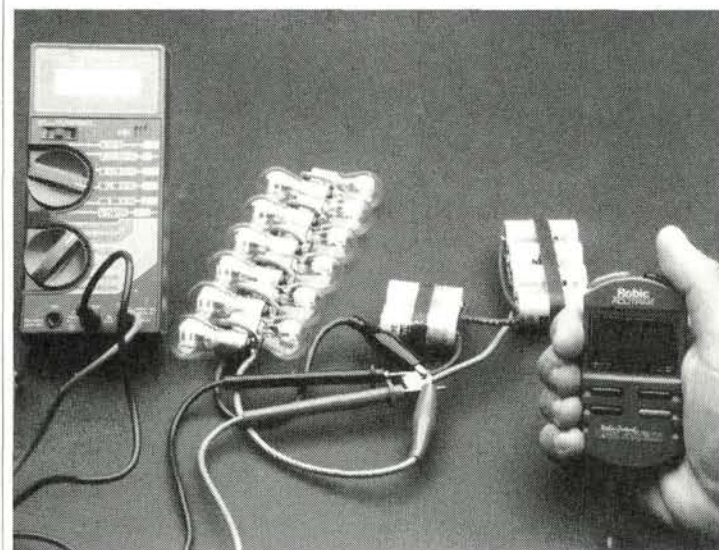
5. This is how the wire should look with the insulation stripped and ready to be soldered. Again, only cut enough insulation to bridge the two contacts on the bottom of each bulb.



6. Tin the wire and solder it across the next bulb's contacts. Repeat this process until you reach the last bulb in the series. Leave at least 8 inches of wire for the alligator clip.



7. To complete the circuit, attach another wire to the case of the last bulb in the series. Attach the second alligator clip to the other end of this wire.



Above: The Dumpster can also be used to rate your packs' performance. Using a digital voltmeter and a stopwatch, you can estimate run time and average discharge voltage.

rates, but they cost a lot. You could use a single resistor, but ones that can handle a load that high are expensive and hard to find. (Often, they're only available from highly specialized electronics shops.) You could combine many small resistors to provide the proper resistance and discharge the battery quickly, but there's no visual indication of when the pack is discharged, and it's a rather time-consuming project. What's the alternative?—the Dumpster!

While researching the ways in which battery packs can be discharged at a high rate for a reasonable price, I met some racers who had connected a series of automobile taillight bulbs in parallel to create a high-

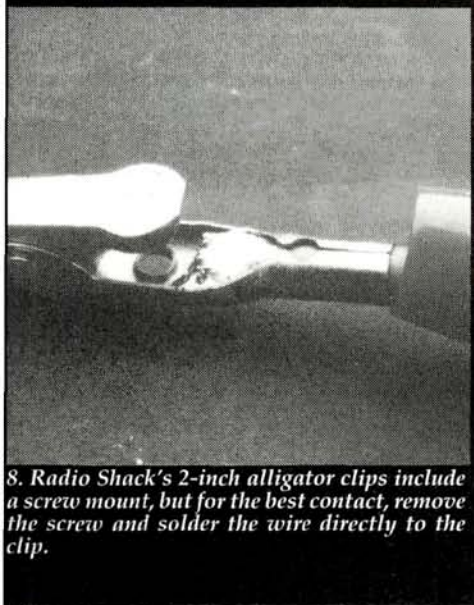
current discharger with a visual indicator. Unlike more complicated systems, this auto-taillight assembly is both simple and inexpensive. Running off an average 6-cell pack that produces 7.2 volts, these bulbs draw roughly 2 amps each. For my discharger, I wired 12 no. 1157 bulbs in parallel for an average draw of about 24 amps, which is typical of the drain under race conditions.

HOW DO YOU MAKE ONE?

To assemble "the Dumpster," start by tapping a nail into a board that's slightly wider than the brass base of the bulbs. Put one bulb up against the nail and a second one at 180 degrees against the first, so their brass portions touch (see photo no. 1). Hammer in another nail to hold the two bulbs in place and solder them together. (A high-temperature iron is essential for a good solder joint; see photo no. 2.) Next, remove one of the nails, lay down a third bulb (facing in the opposite direction from the one next to it), and solder it into place. Repeat this process until



4. After soldering one end of the wire to the first bulb, strip off a section of the insulation to allow the wire to be soldered to the next one. Strip only enough to bridge the two contacts. If the wire touches the brass part of the bulb, there will be a short.



8. Radio Shack's 2-inch alligator clips include a screw mount, but for the best contact, remove the screw and solder the wire directly to the clip.

you've joined the appropriate number of bulbs for the number of cells you'll be discharging. Now that you've connected the bulbs' negative contacts by soldering their brass bases together, the positive terminals must be wired together. The positive contacts on one side of the row should face upward at approximately a 40-degree angle, and the contacts on the other side should face the other way at the same angle (see photo no. 3). Solder one end of the wire across the first bulb's contact. Make sure it faces a direction that will allow you to wrap it across the contacts of the bulb next to it. Mark and remove the wire insulation; leave enough so that when the wire is soldered on, it won't short to the metal bulb housing (see photos no. 4 and no. 5).

Continue wrapping and soldering the wire across the contacts (see photo no. 6). When the last bulb has been soldered, there should be about 8 inches of wire left. Solder the wire for the negative lead to the brass base of the last bulb in the chain (see photo no. 7).

You can connect the Dumpster to your battery in a number of ways, but it's simplest and cheapest to use alligator clips (see photo no. 8). Connectors are definitely out of the question. With such a high-current draw, some arcing occurs when you connect the Dumpster to the battery, and this could weld the connector together. To reduce arcing at the contact point, you could put a switch in line, but you'd have to replace it regularly. It's best to let the alligator clips become slightly blue before you change them.

BUT IS IT ANY GOOD?!

How effective is the Dumpster? Well, if you have large pockets in your pants or jacket, you can take it to the drivers' stand and put it on your batteries right after a race. (Batteries should be discharged as soon as possible after a run.) If you want to check how much time is left in the pack, use a stopwatch to time how long it takes for the bulbs to dim.

The Dumpster can also be used as a makeshift battery matcher. Just charge your 6-cell pack at the recommended amperage rate, let it peak once, hit it again, then connect it to the Dumpster. A stopwatch will measure the time elapsed between peak and dumped voltages, as indicated by a voltmeter. If you want to go a step further, you can take voltage readings every 15 seconds or so to determine an average discharge voltage.

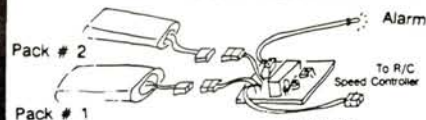
When it comes to pinpoint accuracy, this device won't take the place of a complicated battery-matching system or discharger, but it does a good job. After all, this isn't an exact science; it's simply a way to keep your racing batteries in the best possible shape for a reasonable price.

Some words of caution:

- Using too many bulbs can overheat and destroy your batteries.
- Don't think that discharging at a higher amperage rate will make your car go any faster. On the contrary: it could be dangerous!
- Avoid using a high discharge rate on assembled packs that have heavy insulation and end caps: they hold too much heat.
- If you use more than eight bulbs on a 6-cell battery, be sure to keep the battery in the shade, or cool it with a small fan.

Remember, if you want to keep your prized packs in good shape for as long as possible, send them to the Dumpster! ■

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(Continued from page 98)

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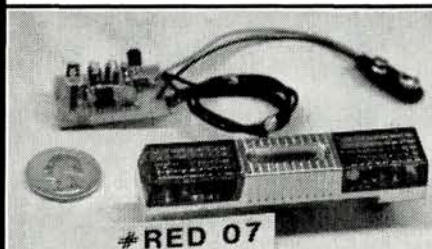
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(Continued on page 142)

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HOT ROD NATIONALS

MAGAZINE
RADIO-CONTROL



Left: Terry Thomas's Concours-winning Gearbox Modified racer.

Below: Gary Wilson's beautifully detailed Tide car took Gearbox Stock Concours. Trophies were presented by Harry Hibler and Jeff Smith, "Hot Rod" magazine's publisher and editor, respectively.



by RCCA STAFF

INDIANAPOLIS, INDIANA—the capital of auto racing in the United States. Every Memorial Day, the Indianapolis Motor Speedway hosts the biggest one-day event in the

world—the Indy 500. Indianapolis Raceway Park holds national drag-racing events and is the site of ESPN's popular Saturday Night Thunder racing events. This year, a new race—the Hot Rod



Magazine Radio-Control Nationals—was added to this city's calendar of great racing events.

Close to 200 racers—who came from as far away as California, Florida and Maine—converged

Left: Gary McAllister won Direct-Drive Concours with this McAllister ASA Firebird body and molded, interior-mounted McAllister MX Pro Chassis with Tecnacraft wheels.



INDIANAPOLIS

ON A SMALLER SCALE



Above: Top honors went to Andrew Callis's Gambler Sprint Car.

on downtown Indianapolis with the hope of winning one of the five national titles that were up for grabs.

Hot Rod Magazine held the R/C Nationals in conjunction with its second annual National Model Car Contest. Last year, an impromptu R/C exhibition race, staged at the static model show, was so well received that Hot Rod decided to raise the status of the race to a national event.

Only Lacking Motion!

At the second annual Hot Rod Magazine Model Car Nationals, the real modelers came out of the woodwork. The time these people devote to detailing these tiny models is mind-boggling: to make many of the older cars, they spend more hours on research than any of us R/C addicts would spend building the latest 4WD off-road terror.



Race cars were popular subjects for the static competitors. The plumbing and wiring are all in place, and up close, you can even find the ignition switch on many of the cars. It's a shame there's no way to race them against one another! After the models have been assembled and painted, however, all that's left is to put them on display.

I saw many models I'd like to own, but not one that I'd have the patience or the skill to duplicate. The dioramas were among the most interesting exhibits: many had several vehicles, people and other accessories that put the cars in a realistic scene—sort of like a scene captured in a snapshot. One was really amazing: Richard Petty's STP Pontiac was captured in mid-flip—with parts seemingly suspended in air! These models came close to looking as if they were in action as they sat motionless.



On Saturday afternoon, two hours before the show was to close, only a handful of spectators were still inspecting the model cars on the long tables, but the bleachers overlooking the R/C oval track were packed. A crowd stood around the track, three and four deep. It was obvious that although a detailed plastic model may be more impressive on a mantel, when it comes to show time, R/C cars draw even the diehard modelers to catch the action.

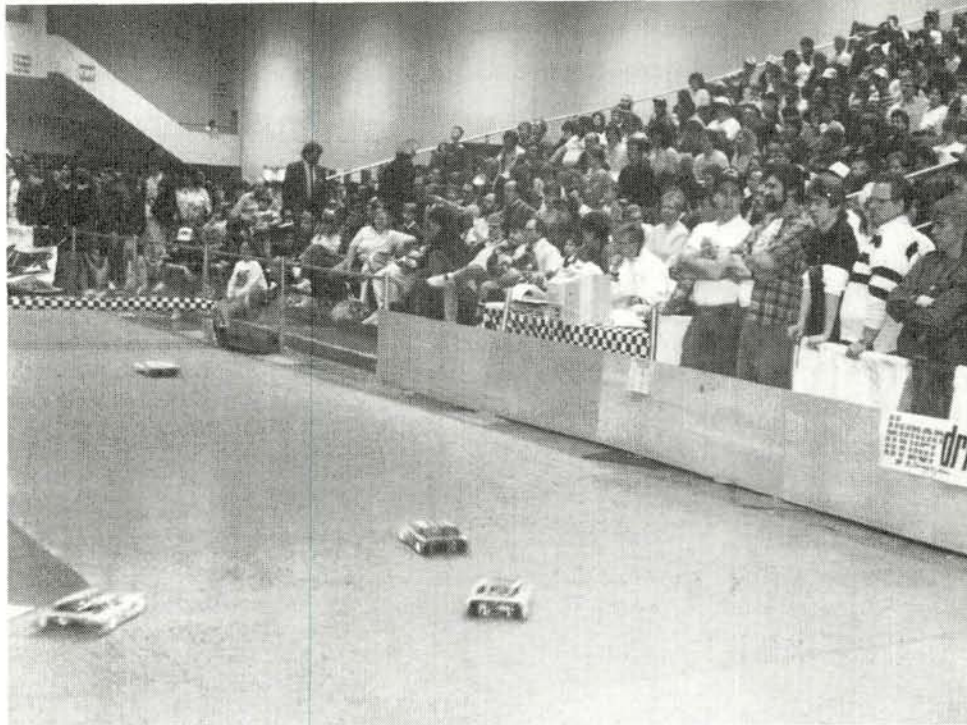
SETTING THE SCENE

The track was a short, carpeted, oval affair, and an ABS system handled the scoring—the only way to go in a national event. The five 1/10-scale classes were Direct-Drive Stock and Modified, Gearbox Stock and Modified and Sprint Car.

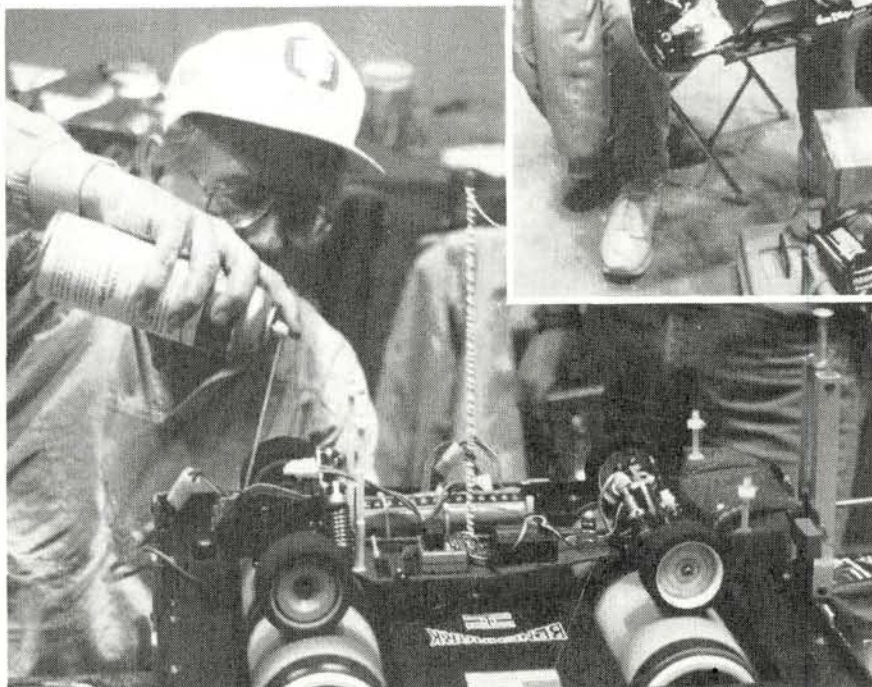
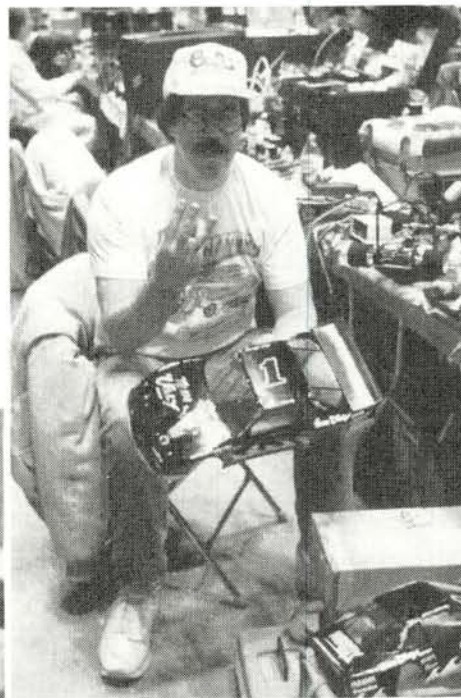
Cars in the Direct-Drive Class had to use NASCAR or ASA bodies, while the Gearbox Classes were also permitted to run wedge-style bodies. The two Modified Classes and the Sprint Car Class were all permitted 7-cell battery packs.

The event was run on a temporary track, so the schedule was tight—as was pit space—and the race organizers had to clear everyone from the building so that they could lock up. (It's much easier to stage an event at a permanent R/C facility than at a temporary track!)

Three full rounds of qualifying sorted out the fields. In the Direct-Drive Classes, Mike Reniger TQ'd in both Stock and Modified with a Fantom-powered Associated 10L. Driving a CAM-powered Hyperdrive Ultima conversion, Ralph Burch TQ'd in Gearbox Modified, and Gary Wilson's Dominator took the top spot in Gearbox Stock. Wayne Thomas drove a scratch-built Ultima Sprint Car to capture the TQ position in that category. Thomas's hybrid motor had a Revtech can with a Fantom armature.



Obviously, standing room only—a big spectator turnout.



Above center: The large pit area was constantly buzzing. That's Carl Christy of Team Ugly. Above: Some racers spared no effort; this prototype car dyno was well used between heats.

CONCOURS

The Concours competition was held before the Mains were run on Sunday. Gary Wilson took Gearbox Stock Concours, and Terry Green topped the Direct-Drive Stock Concours. Gearbox Modified Concours honors went to Terry Thomas, and Gary McAllister won the Direct-Drive Modified Concours trophy. In the Sprint Car Concours, Andrew Callis walked away with top honors.

LET THE MAINS BEGIN

In the Gearbox Stock A-Main, Rod Fish came from the back of the pack, with a G-Force/RC10, to win over Hank Hagquist, who drove a JR-X2. TQ Gary Wilson held on for 3rd place.

In the Direct-Drive Stock A-Main, TQ Mike Reniger didn't stay in the lead for the whole race, but he did get back to 1st by the end of the Main for a hard-fought victory over John Pens, who drove a Composite Craft Lynx II to 2nd place. Mike Pulfer took 3rd with a TQ Eagle.

Wayne Thomas drove to an easy, one-lap victory in the Sprint Car A-Main. Terry Slatman's Ascot/RC10 took 2nd place, and Roland Bayley moved up from the 7th starting position to finish 3rd with his Big Boys/RC10.

In the Gearbox Modified A-Main, Scott Ellenberger started in 2nd and drove his G-Force/RC10 to victory, as Gary Wilson finished 2nd with his Dominator. Although TQ Ralph Burch fell way back, by the end of the A-Main, he had fought his way to 3rd place.

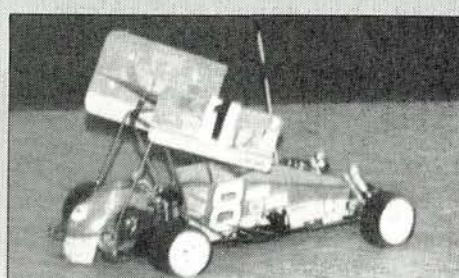
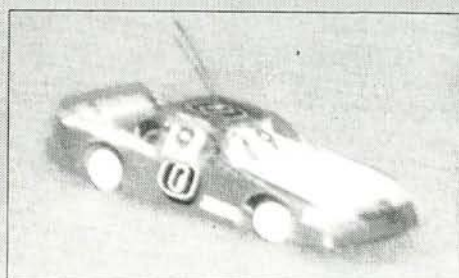
HOT ROD MAG NATS

Direct-Drive Modified

FIN	QUAL	NAME	CHASSIS	MOTOR	ESC	BATTERIES	BODY	TIRES
1	4	Chris Schreider	10L	Wimpy	Tekin	Gonzo	Fantom Camaro	Bolink
2	8	Dwight Smith	10L	Reedy	Novak	Power Push	Assoc. Lumina	TRC
3	3	Carl Christy	10L	Reedy	Novak	Power Push	Assoc. Lumina	Assoc.
4	1	Mike Reniger	10L	Fantom	Tekin	Killer Volts	Fantom Camaro	Boss
5	6	Ron Ferguson	10L	Wimpy	Tekin	Gonzo	Prem. Des. Lumina	TRC
6	5	John Pens	10L	Twister	Novak	Schoenau	Bolink Lumina	Assoc.
7	9	Mike Davis	Agitator	Trinity	Novak	Leading Edge	Leading Edge Cav.	TRC
8	2	Mike Puffer	TQ Eagle	Fantom	Novak	Advantage	McAllister Firebird	TRC

Gearbox Modified

FIN	QUAL	NAME	CHASSIS	MOTOR	ESC	BATTERIES	BODY	TIRES
1	2	Scott Ellenberger	G-Force/RC10	Checkpoint	Tekin	Trinity	Parma Camaro	Twinn-K
2	3	Gary Wilson	Dominator	Checkpoint	Novak	Trinity	Prem. Des. Mustang	Twinn-K
3	1	Ralph Burch	Hyper/Ultima	CAM	Novak	Hyperdrive	Bolink Camaro	Hyperbite
4	4	Bill Morton	Hyper/RC10	CAM	Novak	Hyperdrive	McAllister Camaro	Hyperbite
5	6	Chuck Ray	Scratch/MIP	Twister	Novak	Associated	Bolink Camaro	Bolink
6	5	Ronald Thomas	G-Force/RC10	Checkpoint	Tekin	Trinity	Parma Camaro	Twinn-K
7	7	Terry Thomas	Scratch	Trinity	Tekin	Sanyo SCE	Bolink Firebird	Twinn-K



Sprint Car

FIN	QUAL	NAME	CHASSIS	MOTOR	ESC	BATTERIES	BODY	TIRES
1	1	Wayne Thomas	Scratch/Ultima	Revtech/Fantom	Tekin	Gonzo	Parma	TRC
2	4	Terry Slatman	Ascot/RC10	Wimpy	Novak	Gonzo	Big Boy Toys	TRC
3	7	Roland Bayley	Big Boy/MIP	Revtech	Novak	Revtech	Big Boy Toys	Twinn-K/TRC
4	9	Rick Oklopp	Big Boy/RC10	Speedworks	Tekin	Trinity	Big Boy Toys	TRC
5	8	Charles Stuart	Big Boy/RC10	Lazer Lite	Novak	Sanyo	Big Boy Toys	TRC
6	6	Andrew Callis	Big Boy/RC10	CAM	Novak	Trinity	Big Boy Toys	Twinn-K
7	2	Jeff Grahn	Big Boy/RC10	Reedy	Tekin	Sanyo	Big Boy Toys	Twinn-K
8	5	Doug Morgan	Big Boy/RC10	Reedy	Novak	Sanyo	Big Boy Toys	Bolink
9	3	Scott Michael	Scratch/RC10	Fantom	Tekin	Gonzo	Big Boy Toys	Bolink

Direct-Drive Stock

FIN	QUAL	NAME	CHASSIS	MOTOR	ESC	BATTERIES	BODY	TIRES
1	1	Mike Reniger	10L	Fantom	Tekin	Killer Volts	Fantom Camaro	Boss
2	2	John Pens	Lynx II	Parma	Novak	Gonzo	Fantom Camaro	TRC
3	3	Mike Puffer	TQ Eagle	Fantom	Novak	Advantage	McAllister Firebird	TRC
4	5	Chip Sears	TRC	Speedworks	Tekin	Gonzo	Fantom Camaro	TRC
5	4	David Puffer	TQ Eagle	Wimpy	Tekin	Gonzo	McAllister Firebird	TRC
6	8	Chad Humble	TRC	Speedworks	Novak	Sanyo	Andy's Lumina	TRC
7	7	Thomas Wideman	Lynx II	Fantom	Novak	Gonzo	Andy's Mercedes	TRC
8	6	Mike Fenstermaker	Bolink	CAM	Novak	Premier Gold	Andy's Pontiac	TRC
9	9	David McCreary	Linder	Race Prep	Tekin	PTI	MRP Camaro	Twinn-K

Gearbox Stock

FIN	QUAL	NAME	CHASSIS	MOTOR	ESC	BATTERIES	BODY	TIRES
1	8	Rod Fish	G-Force/RC10	Racemaster	Novak	Lavco Gold	Assoc. Lumina	Twinn-K
2	6	Hank Hagquist	JR-X2	Black Magic	Tekin	Parma	Andy's Grand Prix	Mini-tech
3	1	Gary Wilson	Dominator	Team Pit Stop	Novak	A-D	Prem. Des. Mustang	Twinn-K
4	2	Ed Fish	G-Force/RC10	Racemaster	Novak	Lavco Gold	Assoc. Lumina	Twinn-K
5	5	William Pope	Parma/RC10	Lazer Lite	Novak	PTI	Andy's T-Bird	TRC
6	4	Bobby Stuart	Ultima	Reedy	Novak	Sanyo	McAllister Lumina	Twinn-K/TRC
7	7	James Champer Jr.	G-Force/RC10	Checkpoint	Tekin	Trinity	Parma Camaro	Twinn-K
8	3	Phil Asseff	Ultima	East Coast	Tekin	B&T	Prem. Des. T-Bird	TRC

In Direct-Drive Modified, Chris Schreider, the fourth-fastest qualifier, drove a perfect race to win the championship with an Associated 10L. Dwight Smith's 10L came from 8th on the starting grid to finish 2nd on the same lap as Schreider. Carl Christy came in 3rd (one lap off the pace), driving a 10L. With two TQ titles and an A-Main win already in

the bag, Mike Reniger had some bad luck in this race. Although he finished 4th, he still had a great weekend.

The huge crowd stayed at the track until the last race was over. Many of these people came to see the static model displays and were surprised by the excitement offered by R/C car racing. Thanks to coverage in *Hot Rod*, even more people

will be exposed to R/C racing.

Congratulations to the first *Hot Rod* National Champions: Rod Fish, Mike Reniger, Wayne Thomas, Scott Ellenberger and Chris Schreider. And special thanks to *Hot Rod Magazine* for its first annual R/C nationals. Next year, we're sure that the event will be even bigger! ■

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TROUBLESHOOTING

Welcome to "Troubleshooting"! If you're having a problem that your hobby shop or racing friends can't resolve, give us a shout at Car Action, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to: Troubleshooting, c/o Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897.



The Long and Short Of It

My Kyosho Turbo Optima Mid has a 13.8-inch wheelbase. The Lazer ZX has a longer wheelbase of 14.1 inches. Does this .3-inch difference really affect an off-road car's performance?

Also, what should I adjust if my car is pushing in the turns (or if it doesn't push enough)?

Finally, I have a Checkpoint motor that seems to tick in one direction. When I turn the motor in the other direction, there's no ticking. What does this sound mean?

However insignificant the difference might seem, a longer wheelbase affects the car's handling. As a rule, the longer the chassis, the more stable the car will be on straightaways and through sweeping turns. The opposite is true for cars with shorter wheelbases: they're better suited to tracks with tighter turns and shorter straights. The slight change in wheelbase will hardly be noticeable when the car is on the track. Do you need a longer wheelbase to win? Absolutely not.

To adjust your car to handle the turns, you can make a number of changes. If the car pushes through turns, loosen the rear diff (if you're using ball differentials) to put more power to the front wheels. This will help pull the car through the turns, but it will decrease acceleration. Slightly less spring tension in the front shocks (or

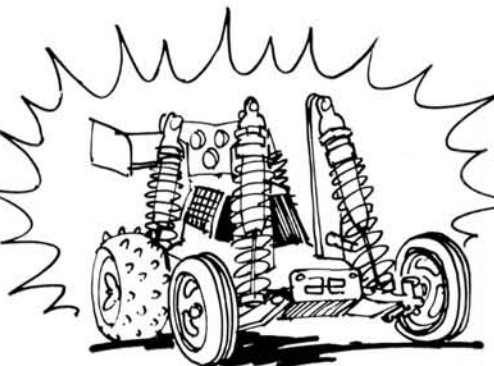
a little more tension in the rear shocks) should also help to get the car around the turns a little more quickly.

Shock oil is also critical: if the oil is too light, the wheels will bounce off the ground or the car will bottom out. If the shock oil is too heavy, the suspension won't compress quickly enough, and this can cause the whole car to bounce. In either case, traction will be a problem, so a change here can improve handling.

If you run the car with an adjustable wing, move the wing forward or use less of an angle for more front-end traction.

Finally, the ticking noise in your motor is common. Ticking is most often heard with a new motor before the brushes have fully seated on the commutator—especially when the brush hoods aren't aligned well. This causes the edge of the brush to catch on the commutator slots, depending on the direction of rotation.

To ensure that the brushes hit the commutator at 90 degrees, check the alignment of the brush hoods with an alignment tool. One is available from FAST Racing Products (4320 Puddlerock Rd., Prince George, VA 23875). After alignment and a good break-in, you shouldn't have a ticking problem.



See Your Local Travel Agent

How I can increase my RC10's suspension travel? I've thought about buying longer shock towers and long shocks, but



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STEVE POND

I can't find anyone who makes the towers.

Jammin' Jay Halsey Racing Products (available through Team Losi, 1655 E. Mission Blvd., Pomona, CA 91766) and JG Manufacturing (P.O. Box 6014, Whittier, CA 90609) both offer long front shock towers that allow the use of long shocks on the RC10's front end. You didn't say whether you have the standard RC10 or the new graphite version. If you have the standard one, you might want the longer front A-arms that come with the RC10 Graphite; these widen the car's stance and increase the range of suspension movement.



Flame Out

I recently bought an 1/8-scale, gas-powered Burns, and I can't get it to run. Every time I try to start the engine, the starter just slips away from the flywheel. The battery I'm using for the starter is fully charged and the starter is brand-new. Is my technique the cause of my starting problems?

Here's the best method I've found for starting a gas-powered car: while holding the starter in your hand, get the starter wheel up to speed, then bump it against the flywheel. Make sure fuel is being supplied to the carb, or it will be a while before the engine starts, but this method seems to be the most effective. Because the starter wheel is moving at high speed, it's more likely to fire the engine than when the starter is bogged down by being held against the flywheel.



Turbo Glitch

I've invested a lot of money in my Turbo Optima, but I have a problem with motor noise. I use capacitors, but they don't help very much. I've tried mechanical and electronic speed controllers, as well as a wide variety of motors, but I still have the same problem. I think the aluminum motor mount acts as an antenna for the motor noise, but I'm not sure.

The fact that you've tried different motors should tell you that your problem isn't motor noise (provided you're using capacitors). If you've changed motors and speed controllers several times, the only common denominator is the radio system.

Check that the radio system has been installed properly, and take all steps to avoid potential interference. The motor mount and the aluminum frame rails are a potential source of interference, but only if the radio's antenna is in direct contact with either. In short, it's best to keep the antenna isolated by installing the receiver next to the antenna tube, away from any electrical wires. If you're sure you've taken all the necessary steps to prevent radio interference, send your radio back to the manufacturer for re-tuning or repair.

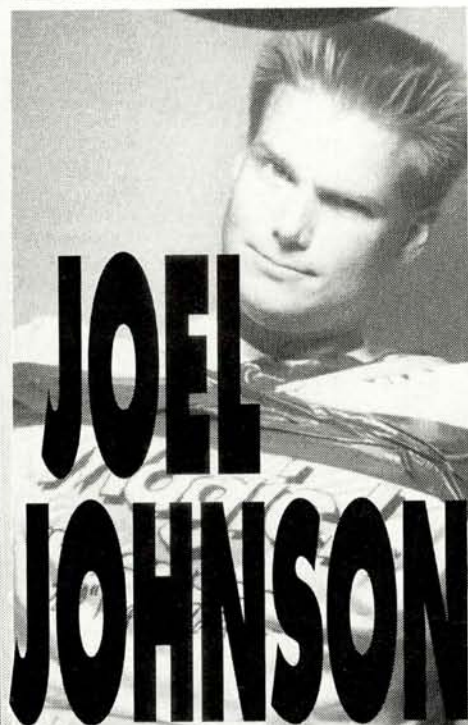


Slip Slidin' Away

Whenever I drive my RC10 on a very smooth surface (like a driveway or hard dirt), the rear end tends to swing around. Also, when I run it off jumps, the front

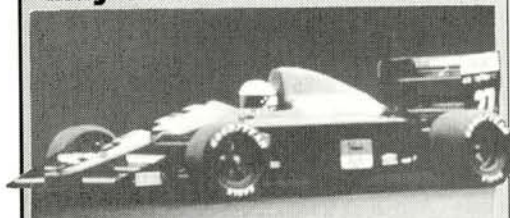
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TROUBLESHOOTING

end always hits the ground first, it digs into the ground and slows the car down. Is there any way to prevent this?

It sounds as if your shock oil is too heavy, or the springs you're using in the rear are too stiff, or both.

A common mistake is to use the same weight oil in both the front and rear shocks; this makes dampening in the rear considerably slower than in the front. When you hit a bump, the front suspension can absorb the impact, but the heavier oil in the rear slows the suspension action so that the impact is transferred to the chassis. This causes the rear to bounce and pushes the nose of the car into the ground when it lands.

A good starting point is to use 30WT oil in the RC10's front shocks and 10 to 20WT oil in the rear shocks with the silver springs that come in the kit.



Blackfoot Blues

I use a Speedworks 427 motor in my Blackfoot. When I give it a little throttle, the gearbox makes a loud grinding noise before the truck starts move to. When I opened the gearbox, however, none of the gears was stripped. The dogbones are in good shape; the joint shafts aren't stripped; and there's plenty of grease in the gearbox. Would a Thorp ball differential solve my problem?

You could be missing the cause of your skipping problem. I've owned a few Blackfoots, and I've found that even a slight rounding of the hex-shaped dogbones ends can cause skipping. You should also check the bevel gears in the differential. If the transmission side plates aren't secured properly, the bevel gears (which allow for the differential action) don't mesh properly with the smaller bevel gears (or planetary gears). This can allow them to skip, but you wouldn't notice the damage during a quick inspection. Eventually, these gears will wear until they strip.

A potential solution is the Miracle Speedway (300 Pheasant Dr., Kalispell MT 59901) differential shim kit for the Hornet. This kit can also be used in the Blackfoot to shim the large bevel gear for tighter mesh in the transmission.

The Thorp differential is certainly a marked improvement over the stock diff but if you're tight on the bucks, see what you can do with the stock hardware before pitching them in the hopper.



Controller Confusion

I'm very confused about which electronic speed controller I should buy. Some are rated at different amps, along with different V/A drops, and some are less efficient. Since I don't know about amps and V/A drops, I was just going by efficiency. If I'm going to spend a chunk of money, I'd like to understand how these things really work.

The type of car you drive should determine the type of speed controller you buy. If you plan to race competitively, stick with forward-only speed controllers. In general, the greater the number of FETs in a speed controller, the higher its efficiency. More FETs also mean a higher price tag.

The amount of voltage that's delivered to the motor determines how fast your car can ultimately go under ideal conditions. "V/A drop" means the amount of volts that are lost per amp through the speed controller. When choosing a speed controller, V/A drop is vital information; however, the numbers most manufacturers publish are simply those of the FETs under ideal conditions, and they don't take into account the overall drop, which includes the circuit boards and the wire used in the controllers. Read John Rist's "Scoping Out" column in Car Action each month: you'll see the differences between most manufacturers' claims and the real-world efficiency of these units.

Bear in mind that the efficiency of the most expensive speed controllers can be thwarted by poor connectors, or by wires that are too long. At the same time, economical six-forward/one-brake FET speed controllers have been seen in more than a few national-level A-Mains. The primary concern when buying a less expensive, 6-FET controller is to be sure that the unit is rated by its manufacturer to handle any modified motor you plan to run. (Some units can't handle hot, 13-turn motors, although most can handle 17-turn motors and up.)

If you don't plan to race, you needn't be as concerned with all the statistics. You might even want to buy a controller that has reverse. The bottom line is that there are many good speed controllers on the market. Your local hobby shop should be able to point you in the right direction. Ask which manufacturers offer—and honor—their warranties, how fast they make repairs, and—most important—how reliable their products are. If you're dealing with a reputable shop and they want your business, they'll point you in the right direction.



Engine Equation

In the September '89 issue of *Car Action*, Bob Kane explained gas-powered cars and their engines in "Dirt Digest." I was confused about displacement and how it's measured or counted. I'd also like to know how piston size varies with horsepower.

To find the displacement of an engine, use this equation:

$$3.14 \times \text{radius}^2 \times \text{bore}$$

"Engine displacement" is simply the volume of the cylinder from the top to the bottom of the piston's stroke. All model engines are sold according to size, which in gas-powered 1/8-scale cars is limited to 3.5cc. Of course, larger engines produce more horsepower, but 3.5cc engines make plenty of horsepower for these cars. Anything larger would be tough to hang onto. ■

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THE LAVCO SYSTEM

Playing matchmaker

by STAFF

SOME MANUFACTURERS guarantee that a pack is made up of 500 SCRs or 700 SCEs. What are these numbers that appear on some of the matched battery packs? They're numbers from Lavco, a company owned by Mike Lavacot and Kent Clausen.

A few years ago, these world-renowned racers teamed up to produce a single-cell charging and discharging system that quickly became the industry standard for rating batteries. The original system had two separate units: the Charge-Mate charged the cell; then, to simulate the conditions that the batteries encounter on the track, the Cell-Mate discharged the cell at 10 amps. The Lavco numbers are simply the discharge time in seconds at a 10-amp discharge rate. A 500 SCR pack should be able to discharge at 10 amps for 500 seconds. Lavco has now released the Charge-Mate Single-Cell Charger and the Cell-Mate 20.

The Charge-Mate is a plain metal box with an "on" switch, a start button, a reset button, and an LCD display on its face. A small black wire comes out of the front of the Charge-Mate, while the back has an



AC power cord, a connector for the Cell-Mate 20, and a large, black heat sink.

The Cell-Mate 20 box, which is the same size as that of the Charge-Mate, has an "on" switch, a start button, a reset button, a selector knob and two LCD displays on its face. Four leads (two red, two black) with alligator clips come out of the front, and on the back, there's a connector for the Charge-Mate and a large, black heat sink.

The Cell-Mate 20 was developed to simulate a 4-minute race. By discharging at 20 amps, the cells are "trained" to respond to real conditions. When discharged at less than 20 amps, the battery gets used to giving up less than its full power. An increase in voltage and run time can be expected after a cell has been cycled a few times with the Lavco system.

SINGLE LIFE

The procedure for using the system is pretty simple. First, hook up the connectors on the backs of the two units. Now, take the single cell and hook the large red clip and the large black clip of the Cell-Mate 20 to the positive and negative tabs on the single cell. The small red and black leads should also be attached to the appropriate tabs, but make sure that the small and large leads don't touch each other. If the cell doesn't have any tabs,

you'll have to solder on some braid or tabs. Using a 3-inch piece of masking tape, attach the thin black wire from the front of the Charge-Mate 20 to the side of the cell. Flip the toggle switches of each unit to the "on" position, and make sure the selector knob on the Charge-Mate is turned to the no. 1 position. Press both reset buttons, then hit the Charge-Mate start button.

The LCD display should start counting, and this shows that the unit is charging. The little black wire taped to the cell is a temperature probe, and it will stop charging when the cell reaches 42 degrees centigrade. When the counter stops counting, charging is complete, and the Cell-Mate 20 kicks into action. To keep track of discharge time, the right-hand display will start counting up at 1-second intervals. The display on the left is the voltage reading, which you can watch as the voltage drops. When the voltage drops below .80 volt, the Charge-Mate 20 will stop discharging and record the total time taken. Depending on its type and condition, the average discharge time for a single cell at 20 amps can range from 200 to 350 seconds. For a rough estimate, you can double the 20-amp number to compare it with the 10-amp number. They may vary as much as 15 to 20 seconds either way.

To keep track of the cell number, charge time and discharge times, you should make a log and number each cell



The Charge-Mate and Cell-Mate 20 are recognized as two of the best systems for matching single cells. The Trinity single-cell holder allows cells without tabs to be matched.

(Continued from page 126)

as you test it. You should also write down the voltage level every 60 seconds during discharge. When assembling packs, you should match cells with similar charge and discharge numbers. By keeping the numbers close, you'll have a pack with cells that should dump at the same time. If the charge time is kept close, your peak charger can bring all the cells up to the same level of charge. Most chargers have trouble charging a pack if some of the cells' charge times differ by more than 100 seconds. By recording the voltage level during discharge, you can see which cells have the highest voltage. The higher the voltage stays during discharge, the more power the cell will have in the car.

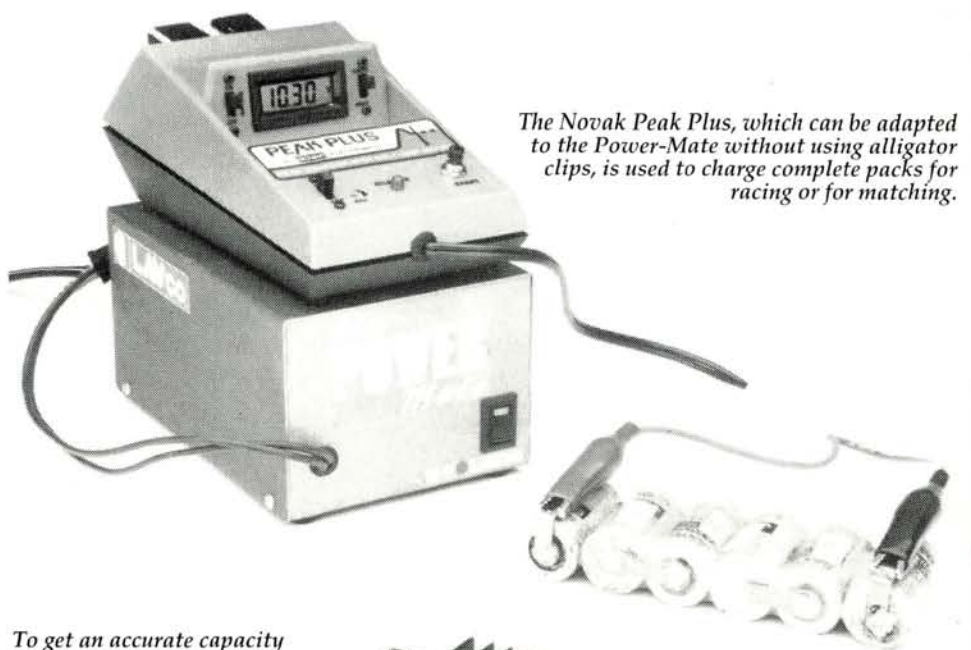
PACKING IT IN

Remember that the Charge-Mate can only charge single cells. You'd think that Lavco would make a peak charger to charge packs—right? Wrong. Kent Clausen explained that there are many chargers on the market that do a good job, and there's no need for another one.

Lavco does make a 10-amp power supply called (what else?) the Power Mate. This small, relatively light unit pumps out a very clean power signal that's specifically designed for peak-detection units, and it won't create false peaks. It comes with an Associated-type plug that will hook directly to a Novak charger or turbocharger. To use the Power Mate with other chargers, you'll have to make an adapter. For the most consistent results, charge your pack as you usually do. (Lavco recommends that you charge at 3 to 4 amps until the pack has peaked and feels warm.)

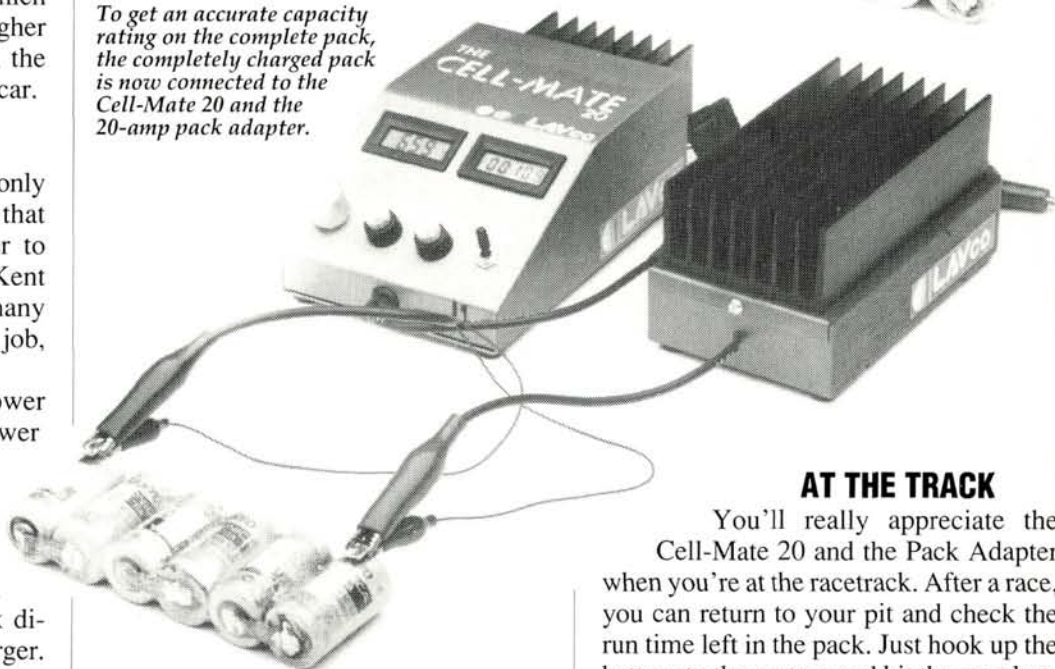
With a Lavco 20-Amp Pack Adapter (a valuable option for the Cell-Mate 20), you can discharge a fully charged 4-, 6-, or 7-cell pack at a constant rate of 20 amps. The pack adapter is a small box with a huge heat sink on the top and three alligator clips (for 4, 6 and 7 cells) on the back.

Once the pack has been charged, hook the small, red lead of the Cell-Mate 20 and the large, red lead of the pack adapter to the positive tab on the pack. Connect the black leads to the negative tab on top of the pack, and turn the selector knob to the proper position. Press the reset button and



The Novak Peak Plus, which can be adapted to the Power-Mate without using alligator clips, is used to charge complete packs for racing or for matching.

To get an accurate capacity rating on the complete pack, the completely charged pack is now connected to the Cell-Mate 20 and the 20-amp pack adapter.



then the start button. Watch the seconds start to rise and the voltage start to drop, and keep track of the voltage every 60 seconds. The pack will stop discharging when the voltage drops below .80 volt per cell (or 3.2 volts for 4 cells; 4.8 for 6 cells; and 5.6 for 7 cells).

With the Lavco system, you'll be able to check the condition of your battery packs whenever you want to. You can also take old packs apart and test each cell individually to see which ones are bad. Remember, your battery pack is only as effective as its worst cell. You might want to rematch all your packs, because there might be some strong cells mixed with some real duds.

AT THE TRACK

You'll really appreciate the Cell-Mate 20 and the Pack Adapter when you're at the racetrack. After a race, you can return to your pit and check the run time left in the pack. Just hook up the battery to the system and hit the start button. If the counter reads 0 seconds, then the battery has dumped, and you should use a better pack or go to a smaller pinion gear. If the counter reads more than 20 seconds, you can try a larger pinion or a hotter motor. Since the Cell-Mate 20 is designed to simulate a 4-minute race, the number of seconds left on the counter show the length of run time that your pack has left.

By using the Lavco Charge-Mate, the Cell-Mate 20 and the Pack Adapter at home and at the track, you can take your batteries to their limit and gain that extra lap or two.

**Here's the address of the company featured in this article:*

Lavco, 3150 E. La Palma Unit B, Anaheim, CA 92806 (714) 632-7262.



WITH A NAME like Pond, you'd think I'd be a "natural" for a boat, and I am—at least, if it's a fast boat. Because most fast electrics use the same radio gear, motors and batteries as R/C cars, it's easy to make the jump from dirt to the watery world of hulls and bows.

• • • • •

WINDSURFERS TO luxury yachts—I've had them all! Well, at least I was exposed to virtually every type of craft: I grew up on the East Coast, right on Long Island Sound. I've tried many kinds, but I prefer big, offshore power boats.

These "thunder boats," as

they're often called, have two monster block engines that are capable of propelling the 50-footers through 7-foot waves at more than 70mph. These speeds might not sound impressive to you car fiends, but remember that 4 to 7 tons of fiberglass and cast iron are

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by STEVE POND



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my home!*



WELLCRAFT SCARAB

SPECIFICATIONS

Type: Offshore deep-vee

Length: 25.5 inches

Beam: 5.9 inches

Weight: 4.5 pounds

Hull Material: Plura (vacu-molded plastic)

Power Req'd: Two 540 motors and two 6-cell battery packs

No. of Channels Req'd: 2

Sug. Retail Price: \$239.95 (without batteries and radio)

Features: Counter-rotating surface drives; vacu-formed Plura hull; pre-trimmed cockpit; injection-molded windscreen; radar arch; instrument panel; seats; and complete fittings. Decals are also included.

Comments: Although some parts of the instruction manual make as-

sembling the Scarab more difficult than it should be, I was generally pleased with the kit. The boat looks great, and it has a performance to match. Because of its scale hull and deep-vee configuration, its cornering leaves something to be desired, but, considering its smallness, the Scarab's speed and ability to handle rough water are amazing.

Licensed by Wellcraft, Robbe Model Sport* produces a semi-scale R/C Scarab kit that preserves the sleek lines and powerful performance of the full-scale boat with some of the finest attention to detail that I've ever seen in an electric-powered R/C boat.

WHAT YOU GET

The kit has a scale hull that's different from most of the other kits I've built. It's molded in the usual two pieces, but instead of having a top and a bottom, it's joined at the vertical center line. The hulls that are molded in a deck-to-hull way usually require a sealed join—a configuration that's not only more likely to leak if it isn't sealed properly, but also produces an unsightly seam that compromises a scale appearance. Because the hull of the Scarab is molded in two halves, there's no side seam, and the halves are plastic-welded at the factory, so it's less likely to leak. The seam *is* rather visible, but if it bothers you perfection freaks, smooth it with a filler before you paint it.

Its other features are a pair of counter-rotating surface drives; a vacu-formed cockpit; an injection-molded windscreen; an instrument panel; seats; and complete fittings. The boat can be painted in any color, but if you aren't too crazy about painting, you can decorate it with the supplied decals. From my *Car Action* desk, I can almost hear you exclaim, "Counter-rotating what?!" Don't let these new terms scare you; any cool car dude can get floatin'.

To run the Scarab, you'll need a 2-channel radio system, two 540-type electric motors, a speed controller, and a pair of 6-cell sub-C rechargeable battery packs. I bet you have this stuff already—right?

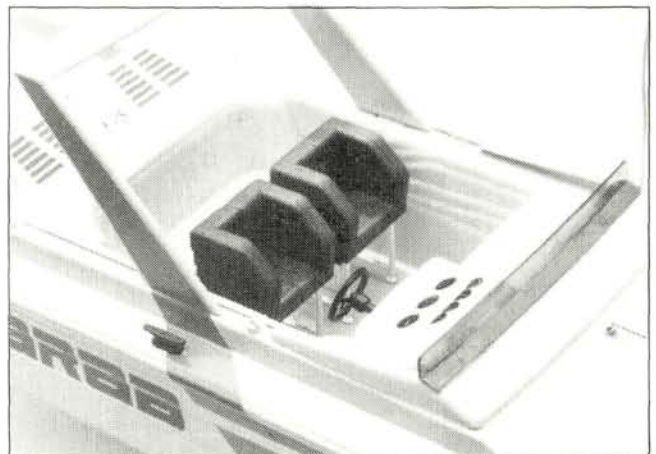
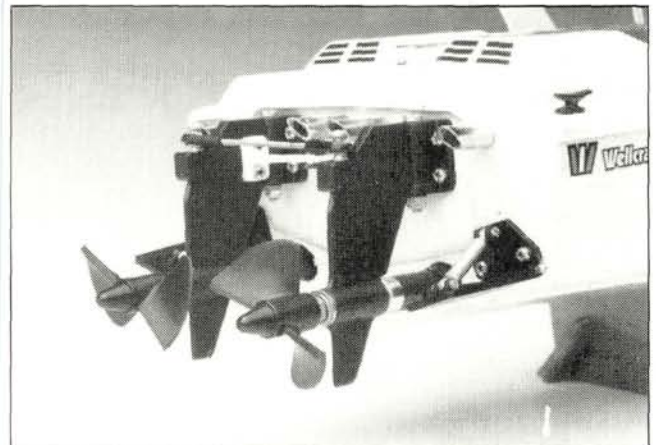
GET GLUING!

The instructions recommend that you use the Robbe Navy Speed Motor Set, the Power Set, and CA and Robbe's Stabilit-Express epoxy for gluing. This epoxy dries very quickly and adheres well to the Plura vacu-formed hull.

To start, glue what's called a "stern component" into the hull. This is an "inner transom" that prevents water from seeping in around the drive shafts, and it's necessary because the universal joints for the surface drives are recessed into the hull.

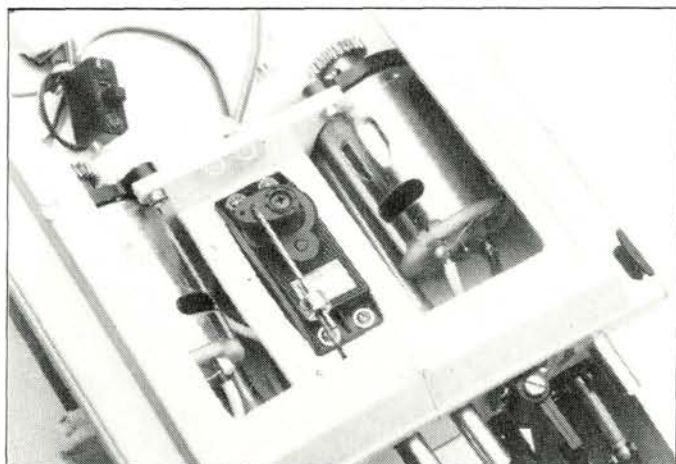
The instructions *don't* tell you that, at this point, there's only .5mm clearance in the outer hull for the recessed universal joint. To prevent binding, the inner hull that holds that shaft housing must be perfectly aligned with the holes in the outer hull. I recommend that you temporarily put the drive-shaft housing through *both* components to ensure proper alignment. If this isn't done, the holes in the hull will probably have to be enlarged later to clear the universal joints. Get it?

After installing the splash rail that's glued around the top edge of the hull, assemble the radar arch (the instructions



Top: The counter-rotating surface drives are what make the Scarab go fast. Note the scale trim tabs and nickel-plated exhaust pipes. Bottom: The Scarab's cockpit has some fine details. Real scale enthusiasts might want to do even more.

WELLCRAFT SCARAB



After a couple of nightmares with other "fast-drying" paints that took a couple of days to dry, I eventually chose Testor's* yellow enamel. Testor's paints dry so fast that you can apply a second coat after about an hour, so you should be able to complete the painting in a day. If the paint runs (doesn't it always?!), just let it dry completely and wet-sand it with a fine-grit wet-or-dry sandpaper before applying more coats.

MOTION POTION!

The motor bulkhead comes next;

sand it to fit the hull before installing it. When you've sanded it to fit, install the gear-drive assembly, the motors and the drive-shaft tubes.

Now attach the stern drive units to the transom. If you follow the instructions, the drives will hang off the transom fairly easily, but pay very close attention while you're completing the steps that come after that. As previously mentioned, the universal joints have only .5mm clearance through the hole in the outer transom. If you push the entire bulkhead and drive assemblies toward the rear of the hull, the drive shafts will protrude far enough for you to attach the uni-

versal joints. Slide the props and the outer shafts through the drives and into the other end of the universal joints.

With the hardware holding the drives on and the bulkhead floating freely in the hull, align the entire drive system so that the universal joints can rotate freely. I started by tightening the drives onto the transom, and then I tacked the motor bulkhead into place with CA. I then checked the clearance once more to ensure that the drive system was operating smoothly, and I epoxied the bulkhead into place. Having completed this stage—the heart of the drive system—the rest of the assembly was a breeze.

A speed controller is necessary to transfer the power from the main battery packs, and Robbe offers a mechanical one that uses microswitches

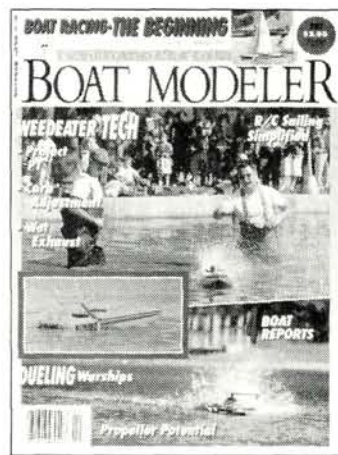


Top: The entire drive system is contained in just 4 inches of the transom, which has plenty of room for the electronics and batteries. Bottom: At the front of the boat, the battery tray holds the main batteries. The speed controller is further forward to allow room for the cockpit inside the hull.

call it a "bar") and glue it into place. I realized that this would restrict access to the inside of the hull, so I opted to leave the arch off until I had completed the assembly.

WATER COLORS

Before painting the hull, make sure that it's exceptionally clean, or the paint won't stick to the plastic. The instructions suggest a "white spirit" thinner, which probably means turpentine or something similar. Whatever you use to clean the parts, try it first on a piece of scrap plastic, and if it doesn't cause a meltdown, clean all the parts to be painted.



The striking red-and-gold Scarab was featured on the cover of the Winter '90 issue of Radio Control Boat Modeler.

instead of the resistor-type switches found in many electric boat kits. Although Robbe's speed controller only offers half throttle and full throttle, it's considerably more reliable than the resistor-type controllers or most electronic controllers because it isn't as much affected by water, and it

(Continued on page 212)

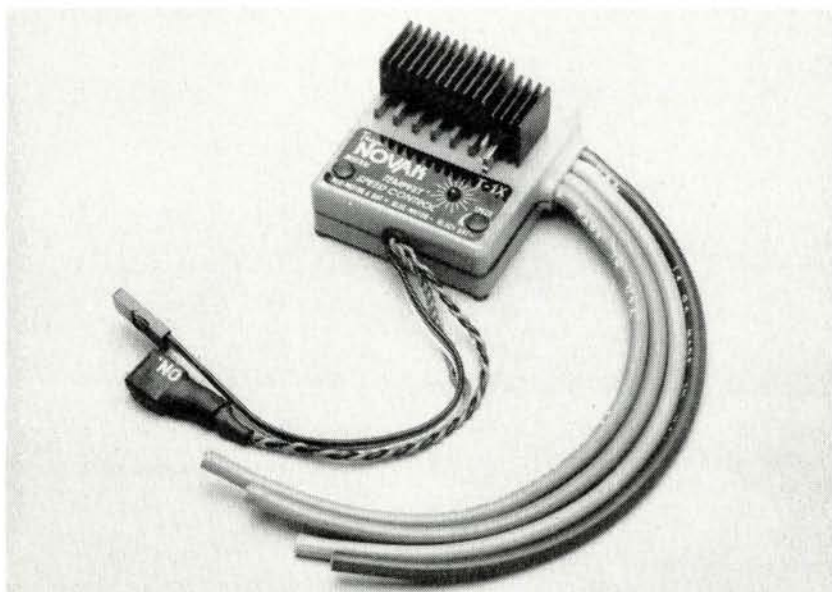
SCOPING OUT

by JOHN RIST

BURNIN' DOWN THE LAB: NOVAK'S T-1X

WHEN I WAS LITTLE, my dad told me that, for years, the Indy 500 was won on Firestone Tires. Of course, he explained that every car used the same tire! I wondered: were Firestone tires *that* good, or was everyone afraid to try something different? This month, I test a speed controller that has won an impressive number of national and international titles. The question is: do the top drivers use Novak's* T-1X because they're afraid to try anything else, or is it really the meanest, "baddest" speed controller around? To find the answer, I subjected the T-1X to the tortures of the "Scoping Out" lab!

The T-1X is a bruiser of a forward-only-with-brake racing speed controller. It has enough FETs to be a reversing speed controller, but Novak has placed 12 of its 14 FETs in parallel to provide an incredibly low "on" resistance and gargantuan current-handling ability. The



The high-quality Novak T-1X delivers a low voltage drop, and its extra weight may only be noticed in small cars (e.g., 1/12-scale road racers).

THE "SCOPING OUT" LAB

John Rist's lab consists of:

- an oscilloscope
- a digital voltmeter
- a resistor load bank
- a 6V 30-amp electricity supply
- a Pit Stop Radio servo/speed controller tester.

The oscilloscope is used to monitor the controller's output and to guarantee that it's fully on.

The digital voltmeter takes all the voltage-drop readings and verifies the reading on the current meter.

The resistor load bank consists of 40, 12-ohm, 5-watt power resistors, which can be switched on and off one at a time to vary the load between .6 amps and 20 amps.

In series with the resistors is a 25-amp Simpson current meter and a 1-percent .01-ohm resistor. By measuring the voltage drop across this resistor, the current-meter's reading can be double-checked. Of course, the lab power supply provides the test current.

other two FETs provide for strong braking. The absence of battery and motor connectors and the use of monster wire are hints that this controller is all business. (If you spend big bucks to get the performance that this controller can provide, it would be silly to burden it with stock connectors.)

The T-1X has the following features:

- 12 FETs for forward and two for brake
- monstrous, 14-gauge motor and battery wires
- built-in, full-speed and neutral adjustment pots
- built-in, full-speed LED
- built-in BEC supply for receiver

This speed controller handles four to 10 cells, and its case and on/off switch are sealed against dirt and moisture. The T-1X comes complete with decals, a Deans gold-plated connector, a heat sink, a motor-filter set, a screwdriver, an instruction book, servo-mounting tape and adjustment-pot-hole plugs.

First, I took the T-1X apart to see whether there was anything lurking inside that could cost me a race. The case is strong; it's held together with four screws; has a rubber O-ring gasket around the edge; and is molded to fit tightly around

the battery and motor wires. There's also a gasket around the FETs to help seal their exit holes. Only the two pot-adjustment holes are left open, but Novak provides rubber plugs for sealing them. This controller isn't waterproof, but it's sealed and should fare well against the dirt and mud that off-road racers endure and the occasional puddle splash encountered by on-road racers.

The printed circuit (PC) board and all the components appear to be of high quality. My only minor disappointment was that the leads of the FETs weren't folded and overlapped to provide a copper-busbar effect to help lower the resistance. In Novak's defense, when FETs must be mounted tightly against the board to save space, bending their leads can do damage. The stress can actually fracture the part case and allow moisture to leak in and destroy the part. Besides, Novak uses heavy solder bridging around the FET leads to increase the controller's current-handling capability. All in all, the T-1X has first-class innards!

LAB TESTS

In the "Scoping Out" lab, the most important thing that I measure is the "on" resis-

tance. I wired the T-1X to a resistor load bank, adjusted the current to a hefty 12 amps, and set the neutral and full-on pots for normal operation. An oscilloscope is used to verify that the full-on set point, as indicated by the built-in LED, is correct. A digital voltmeter measures the input and output voltages: the difference between the two is the voltage loss across the speed controller.

I calculate the resistance by using the formula $R=V/I$ (resistance = voltage divided by current). I take this reading at two points: from the battery input connector to the motor output connector, and at the 2-inch point on the battery and motor wires. The first measurement is an attempt to evaluate the controller in its stock condition; the second is a standard reading that permits me to compare the numerous speed controllers I test.

The T-1X doesn't come with motor and battery connectors, but it does have 6-inch-long wires. I passed 12 amps of current through the speed controller, and there was a .1V loss, which is a resistance of .0083 ohm. I then measured the voltage drop at the 2-inch point on the battery and motor wires. It was .05 volt, or a resistance of .004 ohm. This gives a lot of credibility to Novak's claim of an FET-only resistance of .0015 ohm.

As always, the wires, the PC board and solder joints account for a major part of the voltage drop. To get the full benefit of the low resistance of a speed controller like the T-1X, keep the motor and battery wires as short as possible, eliminate as many connectors as you can, and use only high-current connectors, e.g., Litespeed's* silver-plated ones.

With an "on" resistance of .004 ohm, the T-1X wasn't likely to have a problem with overheating, but Novak claims that it has temp FETs and will shut down before it overheats and is destroyed. For my usual "let-it-cook" test, I switched on all the resistors in the load bank (which increased the current to 20 amps) and ran the controller for 15 minutes without cooling air (no fans allowed for this test!).

At the end of that time, the temperature of the FETs was barely above room temperature. Because the 12 monster FETs share the load, the provided heat sink isn't needed unless you're running a twin-motor monster truck, or a hot 4WD car.

I wanted to heat the T-1X enough to heat-trip the Tempfets. This pricey controller should be able to trip out and bounce back with its FETs humming! To generate some heat, I went straight to the dead-short test, in which I place a shorting device (made from a piece of monster wire and two alligator clips) across the motor "out" leads. This simulates a jammed gear, a burnt-out motor, or stuck-in-the-ditch-type abuse. The current jumped to 37 amps (the limit of my supply). After 15 minutes, the alligator clips and all the test-bench wiring was hot, but the T-1X was only warm. I was determined to overload this baby, so I put some foam-rubber insulation over the FETs. After 10 minutes, the FETs were becoming quite warm, but not the *hot* that I wanted!

I surmised that if I used a battery pack instead of my power supply, I could increase the current. I left the T-1X cooking while I charged a 1200mA, 6-cell battery pack. I plugged the pack in and put the pedal to the metal! My DVM showed that the current jumped to 70 amps. "That should heat it, or break it," I thought. In about 20 to 30 seconds, smoke started to pour out of everywhere, but the current meter showed that current was still flowing.

I closed the throttle as quickly as I could. My battery pack was so hot that I couldn't touch it; all the wires were smoking; and I had blown the ends out of my .01-ohm, 1-percent, precision, current-monitor resistor! I checked the T-1X; it was hot, but not nearly hot enough to trip out! At this point, I decided that I didn't want to see the T-1X overheat. I speculate that if you hurt this controller, you'll have destroyed a battery pack. With its massive set of Tempfets, the T-1X is bulletproof!

(Continued on page 230)

NOVAK

NESC T-1X

DIMENSIONS:

Height (w/heat sink)	.....	.75 inch
Width	.....	1.62 inches
Length	.....	1.8 inches
Weight	.....	1.4 ounces

TUNING:

Access to Controls	.....	Excellent
Ease of Adjustment	.....	Very good

PRICE:

Suggested Retail	.....	\$220
Warranty	.....	90 days

ELECTRICAL:

(Manufacturer's Specs)

Max. Voltage	.....	10.25 volts
Min. Voltage	.....	5 volts
Max. Current Forward	.....	N/A
Continuous Current Forward	.....	576 amps
Resistance	.....	0.0015 ohm

TEST PARAMETERS:

Voltage	.....	6 volts
Current	.....	12 amps

TEST RESULTS:

Voltage Drop to end of wires	.....	0.10 volt
Voltage Drop, 2-inch wire	.....	0.05 volt
BEC Output, 6-Cell Battery	.....	6.12 volts
Resistance to end of wires*	.....	0.008 ohm
Resistance, 2-inch wire*	.....	0.004 ohm

*Resistance=Voltage Drop/Amps

COMMENTS:

The T-1X melted part of my test setup without overheating! Its 12 FETs (instead of the usual six) give it super-low resistance and mammoth current-handling capabilities. This high FET count makes the T-1X fairly large and heavy, however; a 6-FET speed controller is probably better for applications in which lightness and smallness are a must. The T-1X is a natural for twin-motor monster trucks, 6- to 10-cell modified cars and trucks, or any other application that requires raw power and speed. The T-1X's string of national and world championships is testimony to its winning ways.

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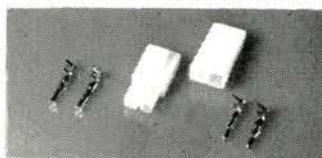
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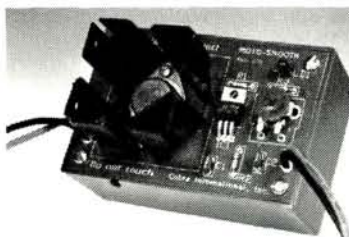
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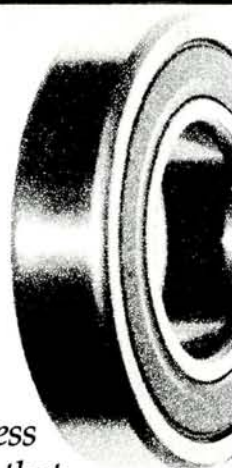
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(Continued on page 146)

30 MPH-OUT OF THE BOX!

The Traxxas Fiero™ GTP is always at the front of the pack. When it comes to out-of-the-box raw power and speed, nothing else can touch it. The suspension is low and tight, and with the wide high-traction foam tires, Fiero corners as if it were on rails. The flexible, one-piece, T-bar rear suspension uses an adjustable oil-filled shock for controlled dampening. The 540S motor is linked directly to a durable gear differential. With either a 6 or 7-cell NICAD battery, the proportional speed control provides smooth acceleration, braking, and reverse.

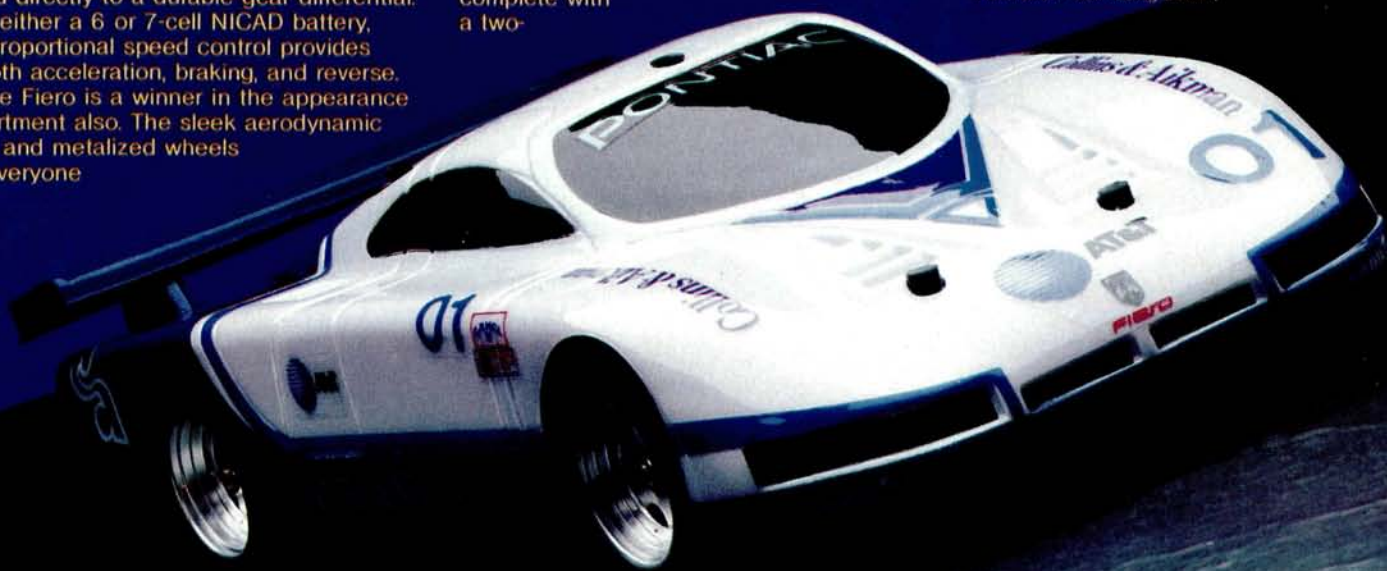
The Fiero is a winner in the appearance department also. The sleek aerodynamic body and metalized wheels tell everyone

this car means business. On fully assembled Fieros, the body is already painted and decaled so it is truly ready to run. Two different colors are available; striking metallic Candy-apple red, or original blue and white.

Because Traxxas is the ready-to-run leader, Fiero is backed with abundant parts support and a toll-free technical assistance line. Factory assembled Fieros come complete with a two-

channel pistol or stick radio system which uses individual receivers and servos. The radio system can be removed and put in other future models. Fieros are also available as unassembled kits with detailed instructions. If you want to be the fastest on your block, check out the Fiero at your favorite hobby shop.

30 MPH radar clocked with factory shock, out of the box Fiero and 7-cell racing battery.



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(Continued from page 144)

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(Graph shown represents actual
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SOLDERING

KEEP THE POWER FLOWIN'

by FRED MURPHY

MANY first-time modelers are in a hurry—they can't wait to run their cars. This enthusiasm is great, but it can create problems if it isn't tempered with some basic knowledge and the patience to do the job right. In the past, I've discussed all kinds of basics, from cleaning to proper pit-box supplies, but I haven't covered the basic wiring and soldering skills that every modeler should learn.

Once you understand the basics and practice the correct technique, you'll find soldering easy. You'll need a 25W pencil-type soldering iron, some 60/40-grade rosin-core solder and some small pieces of shrink-tubing. These items are inexpensive, and they're available at most hobby and hardware stores.

Soldering combines metals that form a continuous path through which an electrical current can flow. The 60/40 rosin-core solder (the best for electrical work) is made of 60 percent tin, 40 percent lead

and rosin flux. The flux acts on the wires as a mild cleaning agent, and it eliminates oxidation that might occur as a result of bad, or "cold," soldering. If the wire to be soldered has any grease, visible oxidation or rust on it, it will have to

be cleaned with 220- or 320-grit sandpaper. With multistrand wire, you'll have to strip off the insulation to expose the clean wire.

The soldering iron must provide enough heat to make a connection before the flux burns off or before the heat damages any plastic components.

For a professional-looking connection, apply solder to the connections before you join them—a process

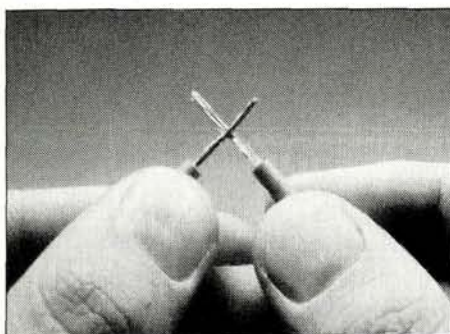
called "tinning." With the soldering iron, apply a light coat of solder to each end of the wire. If you put the ends next to each other and touch them simultaneously with the iron, the solder will quickly flow together. With tinning, the soldering iron isn't held on any one connection for too long, and this avoids damage to wire insulation and plastic parts.

SHRINK-TUBING

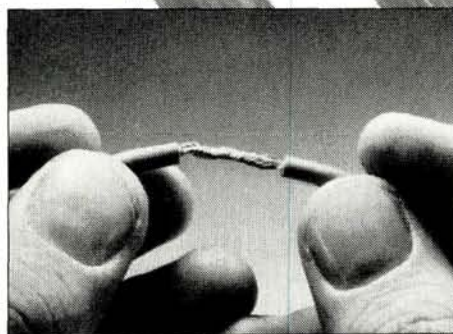
Shrink-tubing will do just what its name implies—shrink. The tubing should be of a slightly larger diameter than the wires you're soldering. Shrink-tubing is activated by heat, and it must be placed on one of the unconnected wires. Make sure the tubing isn't near the soldering point, or it will shrink before you've had a chance to slide it over the completed solder joint. Once the connection is complete and the shrink-tubing is in place, heat the tubing with a heat gun or hair dryer (it should be on a low heat) until it shrinks over the soldered joint. This neatly finished joint is easy to install in your model.

WIRE POLARITY

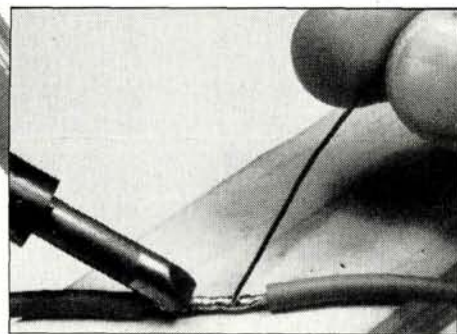
Make sure the polarity of the wires is correct—power wires are usually red;



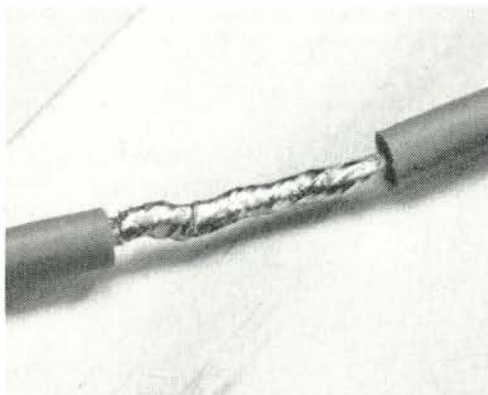
To produce the best join, expose clean, new wire. Dirty, old wire will cause problems. Note position for twisting wires together.



A straight, snug twist will make a smooth, soldered joint, so the shrink-tube can be easily slipped over it.

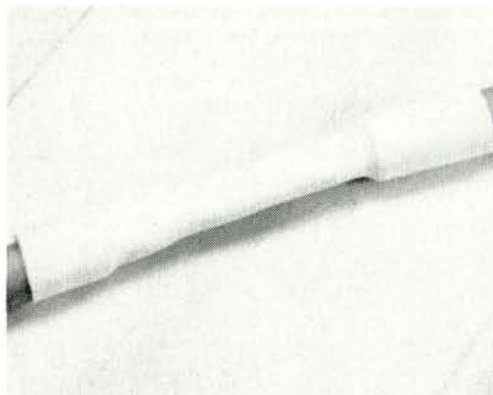


If you use 60/40 rosin-core solder (see text) and apply heat to the surface to be soldered, not to the solder itself, you'll do the job quickly and you won't melt the insulation.



Above: A good joint is one in which solder has flowed into the braid, and it's shiny, not dull.

Above right: Before you apply heat to the shrink-tube, make sure that enough of the tube extends over the insulated part of the wire for good transitional support.



ground wires are black or white. Before applying power, note the wire's color codes, and make sure that they're spliced correctly, or you could severely damage the electrical system. This is critical when you're working with connections to your radio system, servos, receiver, or electronic speed control. Write down the color codes, just in case you forget.

Cross-wiring in the radio system will destroy electronic speed controls; it's easy to make a mistake, so use caution at all times. Check and double-check before you turn on the power, and don't

Good soldering techniques are an easy and inexpensive way to eliminate power outages.

assume that the color coding of wires is the same from one system to the next.

Your R/C car's performance depends on its wiring. Good soldering techniques are an easy and inexpensive way to eliminate power outages. With a little practice, your soldering jobs will look like those of the pros.

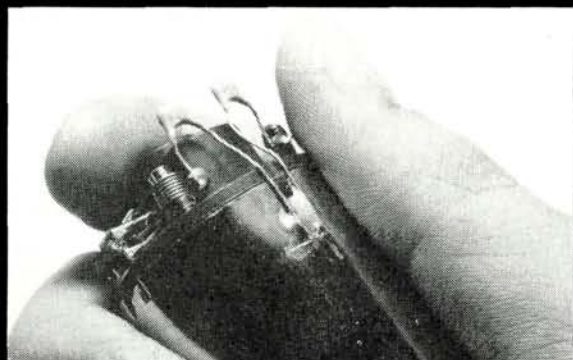
**Here are the addresses of the companies mentioned in this article:*

VRP, 4555 Groves Rd., #15, Columbus, OH 43232.

Dan's RC Stuff, 9525 Cozycroft Ave., Chatsworth, CA 91311.

Sanyo, Battery Division, 200 Riser Rd., Little Ferry, NJ 07643. ■

WHAT'S HOT; WHAT'S NOT!



When other surfaces have to be soldered, e.g., this motor can, use a 45W iron instead of a 25W. It does the job quickly, and transfers less heat to the sensitive magnet.



When making up your own packs, a hotter iron like the 45W will do the job faster and spare the cell from excessive heat.

When you first get into the R/C hobby, a 25W soldering iron can usually handle your soldering needs, but as you advance, you'll find that some jobs call for more.

Soldering capacitors to a motor can require more heat than a 25W iron can supply. Motor-can metal is much thicker than the wire for which the 25-watter was intended. If you use this iron, you'll have to hold the tip to the metal for a longer time, and this will weaken or may

even crack the heat-sensitive magnets, and so destroy the motor.

The solution?—a 45W iron! Because the iron's higher temperature heats the can quickly, damage to the magnets is avoided.

Quick heating is also vital when you're soldering batteries. As you gain more experience, you'll probably start buying unassembled battery packs. To connect the cells, battery braid, VRP* Lectraflo, or Dan's* Gold Bars are usu-

ally used. Although Sanyo*—the makers of the most commonly used batteries in R/C—doesn't recommend that you solder directly to the ends of the batteries, most of us do, because the tabs on some cells don't have enough contact. A 45W iron allows you to heat up the battery's metal casing quickly, without damaging the cell's internal structure.

A hotter iron is essential for advanced R/Cers!

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(Continued from page 146)

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(Continued on page 154)



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Kyosho Puts 1/8 Scale Gas on the Fast Track by Bill Jeri

Kyosho is launching a full scale campaign to bring 1/8 scale gas off-road racing to the attention and enjoyment of American R/C racers with a new series of sponsored races. The "Kyosho 1/8 Scale Off-Road Challenge" race series will work to bring you the best in experienced gas racers plus new entries from the ranks of electric racers.

America Follows Trends in Europe and Asia

In Europe and Asia, 1/8 scale off-road gas racing is hot. The size of 1/8 scale both in terms of the machine and the track allows for greater realism and increased excitement. There is a heft to the machine that means serious business. Seven and one-half pounds of highly engineered components are propelled down the straights at speeds from 40 to 50 actual mph.

What R/C enthusiasts in Europe and Asia have found out is that driving 1/8 scale gas cars brings them closer to the real thing. The sound of the engines, the horsepower, the speed, the appearance and even the smell of nitro creates a rush of excitement that Americans can relate to and race to.

For drivers of 1/8 scale gas who come from the 1/10 scale electric ranks it's a chance to test their mechanical and driving skills with a machine that's faster, heavier and moves like a pit bull on a mission.

New Event for Track Owners

The Kyosho 1/8 Scale Off-Road Challenge race series will be taking place all across the country. At chosen tracks, these sponsored race events will be given extensive publicity.

From these track locations, Kyosho expects the speed, the excitement, and the absolute fun of 1/8 scale gas to spread to selected R/C tracks all over America.

With 1/8 scale gas off-road a track owner is offered a new form of racing. One that turns up the volume and with speeds that can be best described as "ballistic." Spectators love the action and 1/8 scale runs a shiver up the back of R/C car hobbyists looking for a greater thrill.

Almost any good sized off-road track will accommodate 1/8 scale cars. Ideally, the

straights should be at least 100 ft. long and the lanes should be 6 to 8 ft. wide. Smaller tracks can simply run fewer cars per heat. An advantage of 1/8 off-road is that minimal track maintenance is necessary. These cars can tackle virtually any type of surface, no matter how rough.

Racers and spectators get more than just a few brief moments of action with 1/8 scale. In gas off-road, qualifiers are usually in the 5 to 10 minute range with mains lasting between 30 minutes and one hour. Pit stops for fuel are required during the main event.

A Proven Track Record

Kyosho is ideally suited to champion the 1/8 scale gas movement in America. As a leading manufacturer of electric R/C race cars and monster trucks, Kyosho has developed the technology that recognizes the demands of racing at 40 to 50 mph speeds on terrain that can be smooth, rough or anywhere in between.

Kyosho's Burns DX and Turbo Burns 1/8 scale off-road cars are classic examples of designs that match the demands of the racing category. The result is a combination of years of experience with R/C cars and advanced engineering. Unique suspension systems, .21 buggy engines and chassis configurations work together to allow maximum speed with optimum control.

The Kyosho Burns series is an out front 1/8 scale competitive choice and was raced to 2nd Place in the 1988 IFMAR World Championships.

Three Cars in One

All types of people are drawn to 1/8 scale gas cars. While 1/8 scale gas is ideal for dirt off-road racing, the opportunity for other forms of racing is clearly there. Some prefer dirt off-road courses while others lower the suspension, add an 1/8 scale ASA body and tear into some exciting dirt oval action. The addition of a set of slicks puts a 1/8 scale gas car on the asphalt for oval racing.

The versatility of 1/8 scale gives the owner an investment of three cars in one.

1/8 Scale Started It All

1/8 scale gas on-road racing is really the roots of R/C car racing as we know it today. In the 1970s, on-road gas was where it all began. Equipment was crude in those days and reliability was a major stumbling block to early 1/8 races. Electric racing came into being and is almost totally responsible for the explosion of interest in R/C cars of all scales, both gas and electric.

Today, with advances in technology of engines, radios and chassis, the 1/8 scale gas off-road category is a form of racing to be easily enjoyed by any R/C car enthusiast. Kyosho pledges to provide the push needed to raise the awareness of 1/8 scale racing and to rally the R/C racers who wish to share their interest in this high-speed racing class. The "Kyosho 1/8 Scale Off-Road Challenge" race series is only the beginning!

You Can Become Involved

Kyosho is serious about getting 1/8 off-road up to speed in America. If you, your club or track are interested in a ground floor opportunity to get involved in helping to promote this new, exciting category, call Bill Jeri or Tom Grogg at Kyosho (217) 398-3630 or write c/o Kyosho, P.O. Box 543, Champaign, IL 61824-0543.

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(Continued on page 157)

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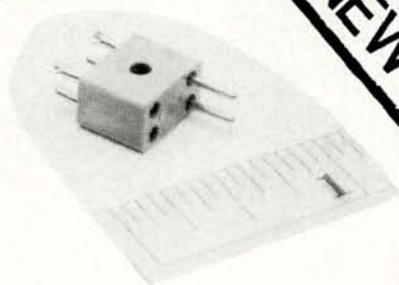
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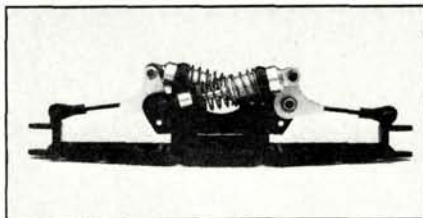
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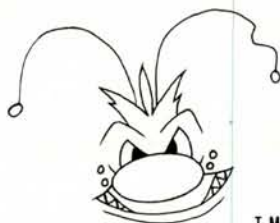
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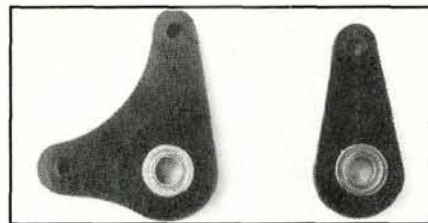


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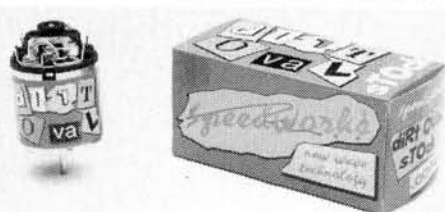


Team Trinity Shirt

This attractive, professionally designed T-shirt shows a Ferrari Testarossa, the trademark Tri-Rex Monster Horsepower mascot and the famous Trinity logo. Printed in a combination of brilliant colors, these shirts are real eye-catchers! (S, M, L, XL, XXL and XXXL)

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SPEEDWORKS Dirt-Oval Stock

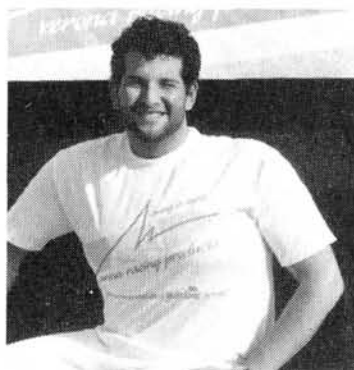
This radical motor is designed to run both 2WD and 4WD oval cars and, like other Speedworks motors, it's durable and has high horsepower.

The Dirt-Oval Stock motor features precision Oilite bushings with a factory-preset 7 degrees of timing. Even with only 7 degrees of timing, the 25-turn configuration allows the motor to run at 24,100rpm. Its new design makes the Dirt-Oval Stock motor one of the sharpest-looking motors on the track.

Part no. 0004

Price: \$25

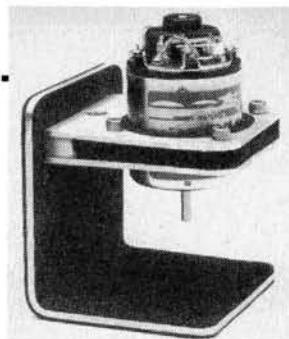
For more information, contact Trinity, 1901 East Linden Ave., #8, Linden, NJ 07036.



VERONA RACING PRODUCTS Racers' Clothing

VRP now offers a line of clothing: short-sleeve T-shirts in S, M, L, XL; long-sleeve T-shirts in M, L, XL; sweatpants and sweatshirts (M, L, XL) have the "Doing It Right" slogan down the leg or arm. The baseball-style, white-satin jacket (XL only) has a crest on the chest and a logo on the back.

For more information, contact Verona Racing Products, 4555 Groves Rd., #15, Columbus, OH 43232.

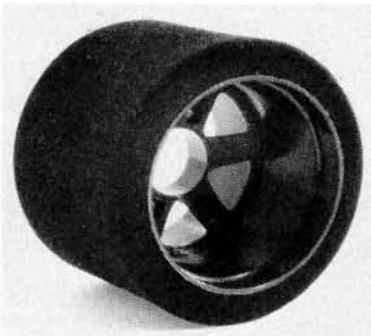


ISLAND HOBBIES Motor Vise

Island Hobbies & Raceway has done it again with its new, exclusive, hands-free Motor Vise—an ingenious, three-piece work station that allows you to keep both hands free to work on your motor. Its space-age, foam-rubber wrapping holds the motor tightly in place—no screws or clamps to damage the motor can. With its strong aluminum core, Motor Vise is the perfect tool when you're soldering capacitors to your motor, adjusting timing or breaking-in brushes. Other benefits of the foam-rubber wrapping include the elimination of motor "walk-away" by dampening noise and vibration.

Price: \$14.95

For more information, contact Island Hobbies & Raceway, 111 Bridge Rd., Hauppauge, NY 11788.



PRO-LINE On-Road Tires

On-road racing just got faster! Pro-Line introduced its new On-Road Tire Series and wheels at the RCHTA Los Angeles Model and Hobby Show. They feature advanced racing compound for longer run time and better acceleration; wheel are guaranteed for the life of the tire; soft, medium and

firm compounds that maximize traction in a variety of race conditions. Each tire is mounted, trued to .002 total run-out and balanced to ± 1 gram.

They're mounted/trued on racing wheel that can be dyed.

Part no. 2001, soft front (yellow): \$12.95 (Note: all prices are for pairs.)

2002, medium front (green): \$12.95

2003, firm front (blue): \$12.95

2004, soft rear (yellow): \$16.95

2005, medium rear (green): \$16.95

2006, firm rear (blue): \$16.95

On-road racing wheels are also available separately:

2564, front dyable: \$4.95

2564C, front chrome: \$7.95

2565, rear dyable: \$5.95

2565C, rear chrome: \$8.95

For more information, contact Pro-Line USA, P.O. Box 849, Steamboat Springs, CO 80477.



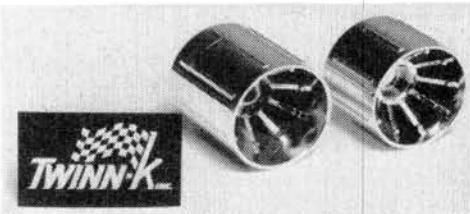
RF TRONICS Precision Ni-Cd Battery Device

Have you ever been a victim of "memory"—the problem that occurs with Ni-Cd battery packs? If you don't completely discharge a Ni-Cd battery before you recharge it, the battery will eventually accept only a reduced charge—reduced amp-hour capacity. RF Tronics has solved the memory problem with the Cad-Cycler, which helps restore a battery pack to its full amp-hour capacity by properly discharging it to a precise, recommended level.

The small, hand-held Cad-Cycler is

all solid state and needs no external power source because it's powered by the battery being discharged. The Cad-Cycler converts any charger into a good battery cycler, and this eliminates the expense of a separate unit. It will stop discharging automatically as battery voltage drops to within .1 volt of a designated stop level of 1.1 volts per cell. All models carry a 6-month warranty against defects in material or workmanship.

For more information, contact RF Tronics, P.O. Box 718, Agawam, MA 01001.



TWINN-K Chrome 1/12-Scale Rims

These chrome-and-gold nylon rims are great for concours competitions. They're designed to fit most 1/12-scale on-road cars, and they're stylishly functional at a price you can afford.

Part no. 0822 to 0825

Price: \$4.95



Corally Adapter

Designed for the Twinn-K Tire Tru (AC or DC), you can true your Corally wheels easily and efficiently with this anodized-aluminum adapter. It's the ultimate accessory for your Tire Tru.

Part no. 1990-06

Price: \$29.95

For more information, contact Twinn-K Inc., P.O. Box 31228, Indianapolis, IN 46231.



BADBOYZ/BADTOYZ Neon Rainbow Sticker

This is the "baddest" neon-rainbow sticker you've ever seen! The new 2x7 1/2-inch Badboyz/Badtoyz Sticker graduates from neon green to neon yellow to neon pink, and it's just right for jazzing up your equipment. Put it on your R/C car or toolbox—looks great everywhere! It's plastic U/V-coated for extra shine and durability! Make the ultimate statement!

Price: \$2 each (one free sticker with each \$5 order).

For more information, contact Barbara Lord, HCZ, Box 748, Yucca Valley, CA 92284.



BONDHUS 10-Piece Hex-Key Set

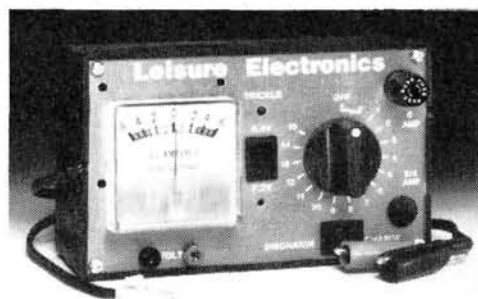
Bondhus introduces a 10-piece set of balldriver hex-key L-wrenches. The BLX-10 contains 10-inch hex-keys—sizes: 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32 and 1/4—all packaged in the patented Bondhex case, which identifies the tool sizes and locks them into place for easy storage, access and use. The Hex-Key has a patented ball design that allows angled entry into fasteners (up to 25 degrees). All Bondhus products are available individually or in sets.

Part no. 10938

Price: \$7.99

For more information, contact Bondhus Corp., 1400 East Broadway, P.O. Box 660, Monticello, MN 55362.

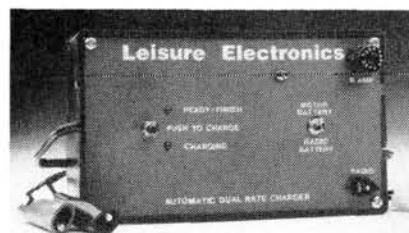
WHAT'S NEW



LEISURE ELECTRONICS 105 DC Charger

Leisure Electronics has improved its classic, often-imitated model 105 DC Charger. New features include an LED trickle display that lights only on the charge cycle. This prevents inadvertent battery discharging and resulting cell damage. Other features are voltmeter jacks and new, more ergonomic rocker switches for switching to 6- or 7-cell packs and the charge/discharge circuits. Appearance has also been improved: the 105's front panel is finished in a tough, attractive, gray-violet, brushed aluminum that has a high-tech look. The new Leisure 105 DC Charger includes a 6-amp fuse to protect its circuits.

Price: \$38



Automatic Peak Dual-Rate Ni-Cd Charger

Leisure's Model 201 Automatic Peak Dual-Rate Ni-Cd Charger simplifies charging: you can connect any 4-, 5-, 6-, or 7-cell battery, press a button and walk away. When the battery is fully charged, the charger cuts off. No ammeters to set; no voltmeters to plug in. The unique smart circuitry automatically changes the charge rate to ensure a maximum charge to the last milliamp of battery capacity. Because it's a dual-rate charger, you can charge your receiver and transmitter batteries

as easily as you charge your motor batteries. Connect a battery to the radio jack, set the switch to "radio battery," and the 201 takes care of the rest. It's so smart that it won't let you damage your batteries or the charger itself. If you make a mistake when wiring the battery connectors or setting switches on the charger, or if you have bad cells in the battery packs, the 201 ready/finish light will indicate the fault by blinking or failing to come on. It requires a 12V DC power source.

Price: \$85

For more information, contact Leisure Electronics, 22971 Triton Way, Unit B, Laguna Hills, CA 92653.



SEES PRECISION MACHINE Nissan King Cab Aluminum Wheels

Sees now offers light, one-piece, directionally spoked aluminum wheels for Tamiya's Nissan King Cab. Precision-machined, they're perfectly round, balanced and extra light.

Part no. SEE2205 (fronts); SEE2215 (rears).

Price: \$39.95/pair



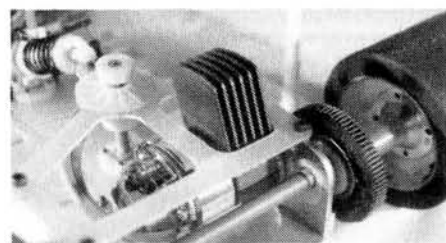
Nissan King Cab Aluminum Wheels

Try these light, one-piece, center-line-style aluminum wheels for Tamiya's Nissan King Cab. Precision-machined, they're perfectly round, balanced and extra light.

Part no. SEE2200 (fronts); SEE2210 (rears)

Price: \$39.95/pair

For more information, contact Sees Precision Machine Works, 1414 W. 134th St., Gardena, CA 90249.

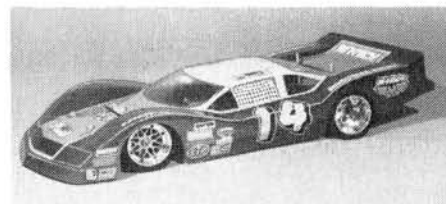


HOLESHOT Super Cooler 2001

Holeshot Racing Products announces the addition of the Super Cooler 2001 to its line of heat sinks. With the fast-growing popularity of 1/10-scale on-road and oval racing, an effective heat sink was needed for cars that couldn't take a Super Cooler 2000. The 2001 was designed to fit cars that have limited space in the upper support plate, e.g., the Associated 10L. The Super Cooler 2001 provides 13 square inches of cooling surface and weighs only .5 ounce—the lightest heat sink available.

Price: \$24.95

For more information, contact Holeshot Racing Products, P.O. Box 630, Canton, MA 02021.



McALLISTER RACING The Luminator

Here's the ultimate low-profile stocker body for oval racing, and it's based on Chevy's new flagship racer—the Lumina. It's built for speed and handling through the corners.

Part no. B-137

Price: \$20

For more information, contact McAllister Racing, 2245 First St., Unit 105, Simi Valley, CA 93065.

(Continued on page 170)

WHAT'S NEW



PEAK PERFORMANCE Animal 16t Quad

Peak Performance unleashes its latest creation—the Animal. A smooth power band makes this the motor to beat in 2WD buggies and monster trucks. At the 1990 Reedy Race of Champions, Derek Furutani's Animal-powered RC10 captured the 2WD Modified Class, and Richard Jamison's Animal-powered truck took top honors in the Monster Truck Class. It's also an excellent 1/10-scale, on-road or 1/12-scale, 4-cell motor. Based on the world-famous Yokomo can, the Animal has wet magnets, heat-sink end bell, high-performance brushes, and the high-quality workmanship and durability that have made Peak Performance modified racing motors internationally famous.

Price: \$80

For more information, contact Peak Performance, 1362 E. Edinger, Unit B, Santa Ana, CA 92705.



HYPERDRIVE Hyperrings (Standard)

Hyperdrive Racing offers standard-size precision differential rings to fit regular diffs. These rings are hard, surface-ground with one side textured to eliminate the need to glue or pin them to the hubs.

Part no. DR 1002

Price: \$3.95/pair



Wing Mounts

Hyperdrive's new, light-aluminum wing mounts are drilled for .078-size wing wire, are 7/8 inch tall, and have two setscrew holes for locking the wing wire and two holes for tightening the mount. A pair of mounts includes setscrews and mounting studs.

Part no. AC 0112

Price: \$7.50/pair



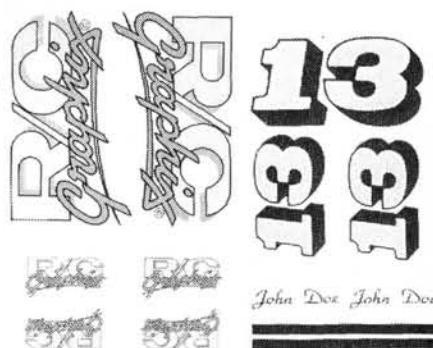
RC10L Kit

Hyperdrive offers a long-anticipated belt-drive conversion for the Associated 10L. The kit consists of four motor pulleys (12, 14, 16, 18), three differential pulleys (66, 68, 70), three belts (74, 76, 78), a rear motor pod and all necessary hardware for a direct bolt-on installation. As well as the belt-performance advantage, the light, one-piece, aircraft-aluminum motor pod offers excellent heat-sink characteristics that help extend running time and motor life. All parts are available individually.

Part no. DR 1002

Price: \$99.95

For more information, contact Hyperdrive Racing Systems, 3210 Howard Nickell Rd., Fayetteville, AK 92703.



R/C GRAPHIX Scale Car Decal Sheet

R/C Graphix proudly introduces a personalized decal sheet for 1/12-, 1/10-, 1/8- and 1/4-scale cars. Finally, here's a decal sheet that's totally laid out and designed by you to give your R/C car a customized look you'll be proud to show off. R/C Graphix offers a wide selection of colors, number styles and letter styles.

For more information, contact R/C Graphix, Dept. C, 3182-A Dove Court, Snellville, GA 30278.



TECNACRAFT Tungsten Carbide Diff Balls

Tecnacraft introduces precision, 1/8-inch, grade 25, type 44A Tungsten Carbide Diff Balls. The tolerances for these high-grade balls are measured in millionths of an inch (much tighter than ordinary balls). If you use these super-tough diff balls, you'll have a smooth, long-lasting diff. They're three times harder than hardened-steel diff balls, and they'll last up to 10 times longer. They're used by Joel "Magic" Johnson and other top racers, and they allow a much finer adjustment for slip (without damaging your diff) and provide a smoother diff action with positive wheel traction.

Price: \$8/pack of 8

For more information, contact Tecnacraft, 1335-B Dayton St., Salinas, CA 93901.

(Continued on page 194)

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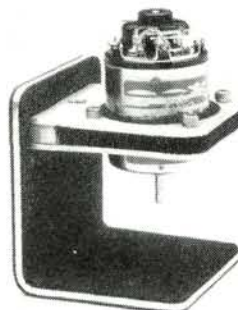
Look At What's **NEW**

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RC10 w/bearings.....	189.95
without bearings.....	149.95
RC10 Graph. w/bearings.....	199.95
without bearings.....	154.95
JRX2.....	169.95
NEW! JRXT.....	189.95

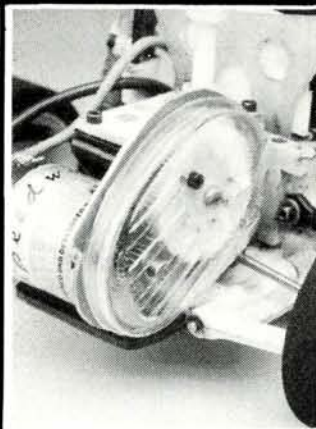
You already know that we've got your parts. Now, Island Hobbies & Raceway is proud to introduce two new products. The RC10 "Dust Cover", made of strong lexan, seals out dirt, dust & water & snaps tightly in place without using body clips. **Price: \$6.95.** The "Motor Vise" is made of strong aluminum & holds your motor in place without screws or clamps which can damage the can, allowing hands-free operation while working on your motor. **Price: \$14.95.**

MOTOR VISE



PRICE: \$14.95

RC10 DUST COVER



PRICE: \$6.95

WE NOW CARRY CORALLY KITS & ACCESSORIES!

TRACK DIRECTORY

(Continued from page 157)

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6017 Northwest Hwy., Chicago, 60631
Greg (312) 775-4848

HOBBY HUT
22 Nameoki Vil., Granite City, 62040
Roy Koberna (618) 451-7330

THUNDER ROAD 31 RACEWAY
3603 Richmond Rd., McHenry, 60050
Vern, Jim or Steve (815) 344-2277

MACHESNEY PARK RACEWAY
1220 Shappert Drive, Machesney Park, 61111
Jack & Georgia Henricks (815) 282-1311

S.T.O.R.M. RACING SERIES
P.O. Box 925, Franklin Ave.,
Franklin Park, 60131

LANE HOBBY MODELS
Lane Plaza Mall
2550 W. Addison, Chicago, 60618
Jack (312) 477-3050

HOBBY CORNER RACEWAY
2195 E. Garfield, Decatur, 62526-5124
(217) 429-4477/4577

(Continued on page 192)

COMING SOON, THE ...

1991

RADIO CONTROL CAR ACTION BUYERS' GUIDE

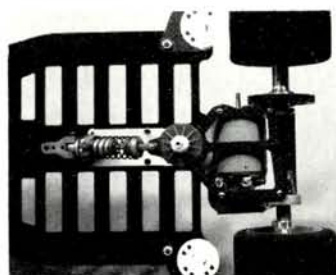
FROM THE PUBLISHERS of Radio Control Car Action comes the fourth annual all-R/C Car Buyers' Guide—the **only** product guide available for the radio-control car enthusiast! This year's guide will be packed cover to cover, with almost 300 pages of the latest in Radio-Control Cars, Monster Trucks, Radios, Batteries and Chargers, Motors, R/C Electronics, Paints and Tools, Accessories, 1/4-Scale Cars and much more!

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**Manufacturer of the
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Equipment.**

**NEW FOR
1990**



10L NARROW REAR END

Designed for the Associated 10L car, this "Narrow Rear End" reduces rear end width to reduce front end push. It centers the motor on the chassis, is lighter, an adjustable three in one "T-Bar" is included, and comes with a "Threaded Center Post" for precise dampening adjustments that don't slip. Upper & lower braces are Graphite. "T-Bar" & T-Bar Spacer are G-10.

#PS01.....\$49.99

Threaded Center Post available separately
#PS02.....\$6.50



RC-10, TQ 10 GRAPHITE LOWERING KIT

Designed for the new RC-10 and TQ 10 dirt cars, this lowering kit lowers center of gravity while laying all four shocks down to allow the use of wedge bodies without the need to cut clearance holes. All hardware included. Made of molded nylon and G-10. Three front shock angles available.

#2026.....\$24.95 #2027.....\$12.95

Outer Shock Mounts available separately

INQUIRES WELCOME

NOTE: Outer front shock mounts are made of G-10, not GRAPHITE.

For Latest Catalog Send: \$2.00 plus SASE, size 4" x 9"

CHEETAH RACING, 10823 Amestoy Ave., Granada Hills, CA 91344 (818) 366-2683

TRACK DIRECTORY

(Continued from page 190)

INDIANA

SOUTHERN INDIANA MODEL RACING ASSOC.

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413 Oolitic Rd., Bedford, 47421
(812) 275-7568

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Don Bole (317) 348-2100

HOBBY CONNECTION RACEWAY

925 N. Lynhurst, Indianapolis, 46224
Carl Gilbert (317) 247-5702

BREMEN BANDITS R/C RACING CLUB

BREMEN HOBBIES

308 N. Bowen, Bremen, 46506

GONZO RACEWAY

Chesterton, IN Jeff (219) 926-4341
Ruben (219) 980-8409

GOSHEN R/C OFF-ROAD RACING

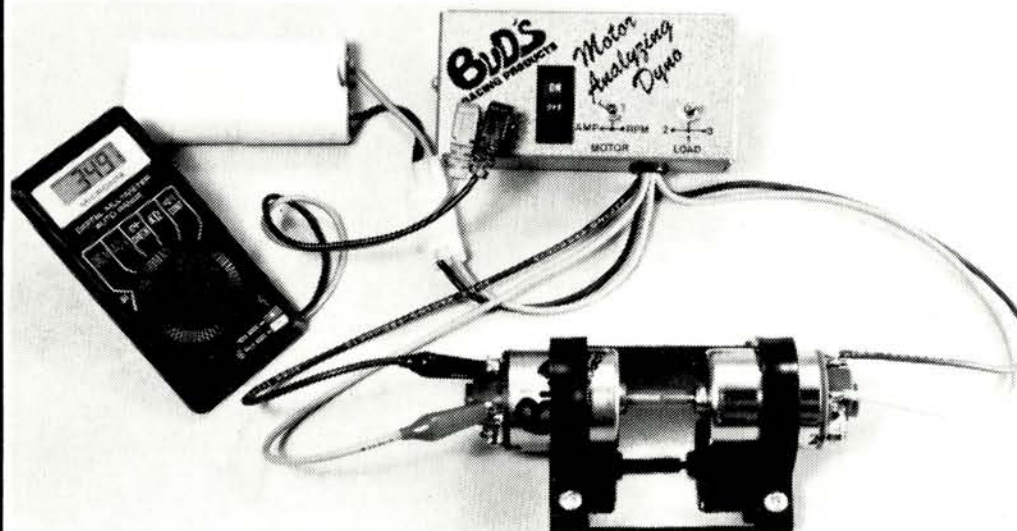
Tim's Hobby Shop, 1922 Elkhart Rd.,
Goshen, 46526
(219) 534-1992

(Continued on page 195)

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WHAT'S NEW



CMP 12V Peak Charger

The Pro Power Peak Electronic Peak-Detection Charger is a self-contained Ni-Cd battery charger that operates from a 12V DC auto battery (or its equivalent). It performs a "self-test" each time it's connected to a 12V DC source and a Ni-Cd pack, and its features include: transistorized current regulation, high-brightness LED charge indicator, 6- to 7-cell selector switch, and automatic switch-over to trickle-charge. The Pro Power Peak comes with alligator-clip battery connectors and a Tamiya Ni-Cd connector.

Part no. CMP-250
Price: \$49.95



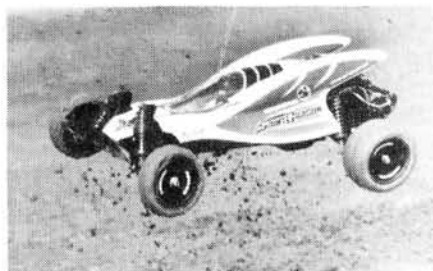
Ni-Cd Battery Enhancer

In keeping with the latest technology, CMP has developed the Phase-II Ni-Cd Battery Enhancer. The Phase-II keeps two charged packs at full capacity while it frees your charger for additional tasks. A precision integrated-

circuit oscillator and two Mosfet power transistors provide a pulsed-output current that's up to 40 times greater than the usual trickle-charge current. The Phase-II operates from a 12V DC, and it comes with a 4-foot cable for the 12V battery and two output cables with Tamiya connectors. Separate high-brightness LEDs show when each battery provides maximum charge retention, power and run time. The Phase-II will help equalize matched cells, prevent voltage depression and bring under-charged packs up to full charge. It may be used with 6 to 8 cells, 800 to 2000mAh.

Part no. CMP-280
Price: \$45.50

For more information, contact Cougar Mountain Products, Inc., P.O. Box 5382, 131 Bound Brook Rd., Parsippany, NJ 07054.

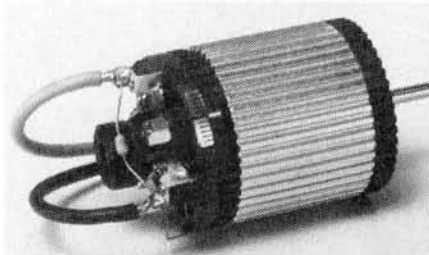


TAMIYA Saint Dragon

Do you want a real, fire-breathing, 2WD off-road car that won't eat your budget but gives hours of enjoyment? Try Tamiya's new Saint Dragon. Its rugged bathtub chassis is easy to assemble and permits quick access to the radio equipment. Front- and rear-wishbone suspension parts have an adjustable coil-spring shock at each wheel for handling any terrain. Driven by a 540-type electric motor, the rear-gearbox design allows quick gear-ratio changes. (The kit comes with a 23-tooth pinion gear, but it accepts a range, down to 16-tooth.) The front and rear spike tires are mounted on dish wheels to keep out dirt and lower the car's center of gravity. A three-step forward-and-reverse speed controller provides the throttle

action. You supply the R/C system and batteries; Tamiya provides the action with the Saint Dragon.

Part no. 58083
Price: \$175



Dynatech 02H Motor

Tamiya has produced a revolutionary new electric motor that produces superior performance—the Dynatech 02H. The 02H has a light, miniature cooling fan that cools the can and rotor, and the case has cooling fins that disperse heat more effectively than it's dispersed on conventional motors. It includes a 13-turn rotor, a hassle-free timing adjustment that permits it to remain in place on the gearbox while you make adjustments, and an effective means of adjusting brush tension. Instead of using spring angles, you merely move the end of the brush spring to one of three settings. Just try that with any other motor! Although the Dynatech 02H is easy to install and adjust, Trinity has added some spice by including newly developed magnets for higher performance. Its 7.2 volts, no-load performance yields 36,000rpm at 3.2 amps.

Part no. U53044

For more information, contact Tamiya/MRC, 200 Carter Dr., P.O. Box 267, Edison, NJ 08818.

Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Radio Control Car Action, nor guarantee product performance or safety. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Radio Control Car Action.

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TRUCKS	
JRXT	\$209.99
KING CAB	\$179.99

ON ROAD	
RC10L GRAPHITE	\$139.99
LYNX II ELITE GRAPHITE	\$173.99
AGITATOR 2.0	\$164.99
CORALLY SP10	\$ CALL \$

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VICTOR IQ SENIOR	\$349.99
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NOVAK-TEKIN-ZETA	\$CALL\$

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TRACK DIRECTORY

(Continued from page 194)

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(Continued on page 202)

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6010	RC-10 Less Bear.	132.84
6016	RC-10 Complete with Bearings	171.21
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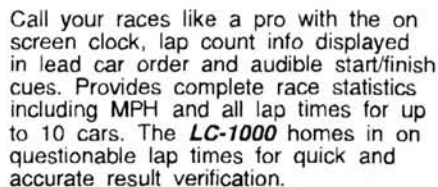
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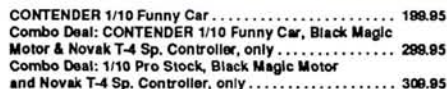
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(Continued on page 206)

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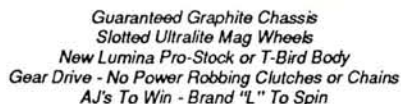


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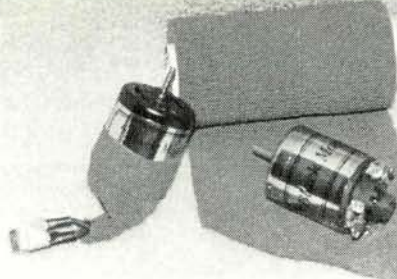
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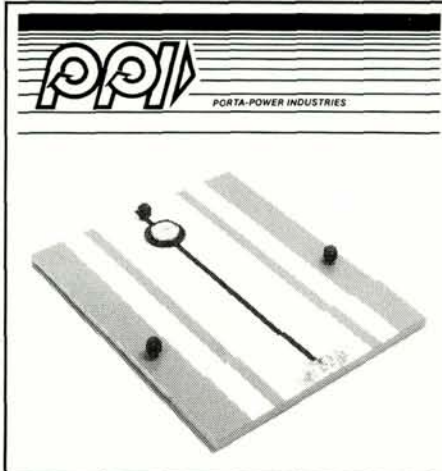


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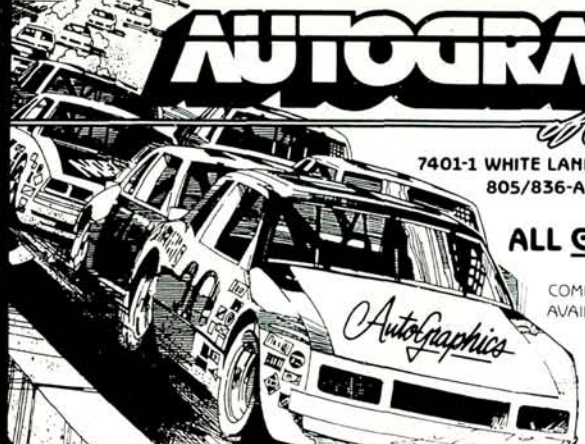
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(Continued from page 210)

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ROBBE SCARAB

(Continued from page 136)

doesn't generate heat.

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The controller is simply attached to the top of the servo and held in place by the servo horn, and I added some double-sided foam tape for extra insurance. It doesn't come with the Tamiya-type bat-

(Continued on page 218)

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ROBBE SCARAB

(Continued from page 212)

tery plugs that you find on many of the batteries you buy at hobby shops. The controller has four wires to which you attach the two 6-cell batteries that are recommended for this boat. The batteries I planned to use had Tamiya-type connectors, so I had to change the connectors on the controller. I mistakenly cut the four wires and soldered on the connectors without first checking to see how they were connected to the speed controller. I attached the connectors to the wires the way I *thought* they should have been, and I later discovered my mistake when I burnt the microswitches. The moral of the story? Attach one connector at a time.

After successfully converting the second speed controller and installing the rest of the radio, all that stood between the Scarab and the water were the final details.

FINE FINISH

The hull's scale appearance and the boat's fine details distinguish it from the rest of the fleet. If you'd like an R/C boat that looks as much like the full-scale version as possible, but you don't want to sacrifice performance, this is an ideal kit for you. The details include: chrome deck rails; a detailed dash panel; driver and passenger bolster seats on chrome stands; a tinted windshield; and molded engine vents. Although some power purists might argue that these details reduce performance, I think a scale appearance is worth it.

With the details completed, it was time to see if this boat could match its good looks with a great performance.

(Continued on page 221)

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ROBBE SCARAB

(Continued from page 218)

POND TAKES TO THE WATER!

With two pairs of fully charged 6-cell packs at the ready, I headed for the beach with my Scarab in one hand and my radio in the other. I tucked a pair of packs into the battery tray under the deck, connected them to the speed controller and put the boat on the water. The Scarab's weight and narrow beam caused it to drop right down to its exhaust pipes. It looked exactly as though it had two big-block en-

gines—a pose rivalling that of a big boat.

A touch of throttle started the counter-rotating surface drives, and the water "boiled." After a few seconds, the Scarab got up on plane, and slowly, as the motors picked up speed with the surface drives running true to form, the water sprayed up in the characteristic "rooster-tail."

To get used to the boat's handling, I tooled around for a while at low speed. Everything was operating as it should, so I squeezed the throttle into the full-speed position. The motors kicked into a high-speed whine, and the Scarab reached full

speed in a couple of seconds.

At 20 to 25mph, the Scarab's smallness gives you the impression that it's moving at more than 50mph. A quick right turn put the boat parallel to the shore and on a long, high-speed run. As it got up to speed, the boat began to rock, and this convinced me that I should back off the throttle and find the cause of the problem. On looking at the trim tabs, I saw that one was riding lower than the other. When the Scarab reached top speed, the part of the hull on which the tabs are mounted rises out of the water. I noticed a minor differ-

(Continued on page 222)

SLEDGEHAMMER RULES!

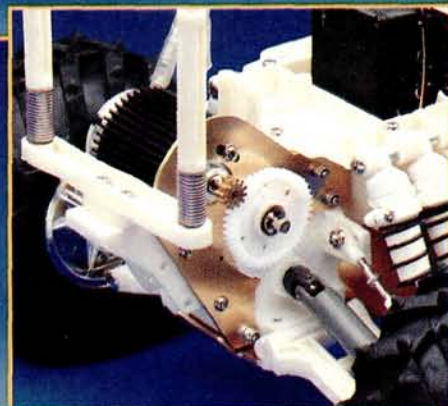
Sledgehammer definitely is not your ordinary truck. The 'Hammer proves its dominance with unmatched wheelie-popping fun and curb jumping abilities. It smooths out the roughest terrain with true four-wheel, independent suspension, and EIGHT high-volume, oil-filled, shocks. Unlike friction or toy shocks, these can be rebuilt and tuned for the optimum dampening effect. Turnbuckles, bolted-on ball connectors, and a giant servo saver are all standard equipment. The unique new high-clearance chassis combines the strength of polished T-6 aluminum and a specially-developed polymer tub for incredible durability.

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Model 1806 Sledgehammers are truly ready-to-run, with a powerful pistol radio system, and the ultimate accessory, a fully-proportional forward and reverse electronic speed control. With this kind of instant available power, Sledgehammer makes wheelie popping excitement an irresistible addiction. Just paint the body, add the decals, and you're ready to rock. For the enthusiast who has his own motor and electronics, and wants to experience the rewards of building it himself, Sledgehammer is also available as an easy-to-assemble kit. If you're ready to tame the ultimate monster truck, check out the Sledgehammer at your favorite hobby shop today.

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ROBBE SCARAB

(Continued from page 221)

ence in trim-tab angle (they're adjustable), and this caused the boat to list to one side when the lower tab was the only one in the water. I made a quick tab adjustment, and it was back in the water. Don't know what trim tabs are? Just read the kit's instructions.

After that, the boat was much smoother on the straights, but cornering (now at full speed) was difficult. The narrowness of the hull caused the boat to lean heavily through the turns. During a controlled turn, the boat leaned enough to lift one of the drives clean out of the water. This isn't *all* bad, because it slows the boat enough to get it safely through the turn (although, at the speeds at which I ran the Scarab, nothing can really be done "safely"). Taking turns too sharply caused the short turn fins on the drives to lift completely out of the water and the boat would then spin.

Another effect of the boat's wild leaning in the turns was that water found its way over the splash rail and into the hull. Very little water gets in, but it doesn't take

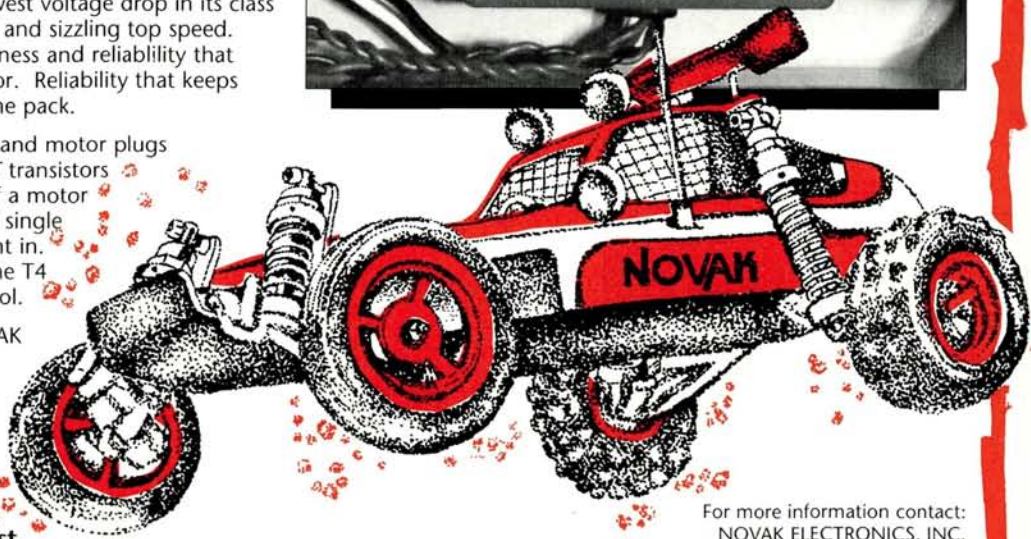
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much to spoil a radio system. At the car track, it isn't difficult to keep our electronics dry, but this is new territory, and you have to take the right precautions. I had to get used to driving the narrow deep-vee hull, but I soon learned its limitations and ran it without mishaps.

The narrow hull handles waves very well. Wider boats that turn better often have a tough time with big waves, because their wider beams vault over them. In contrast, the Scarab cuts through choppy sea, and that's just what its deep-vee hull is designed to do.

For a boat that's powered by a pair of stock Mabuchi-type 540 motors, the Scarab has incredible straightaway performance; in fact, I rank it among the fastest stock electric boats. Its cornering ability leaves something to be desired, but remember that in the design of the full-scale version, cornering wasn't a high priority. In big waves and on long straightaways, the Scarab is really in its element and handles very well. It's also one of the few electrics that resemble full-scale boats enough to be called "scale."

If you want to get your feet wet with an electric boat that's a good compromise between the sharp, scale-looking ma-

chines and the high-performance "could-be-anything" boats, the Robbe Scarab could be just the right combination for you. And if you stand in the water, you'll be so cool!

**Here are the addresses of the companies mentioned in this article:*

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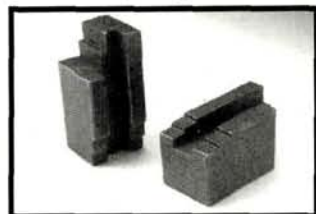
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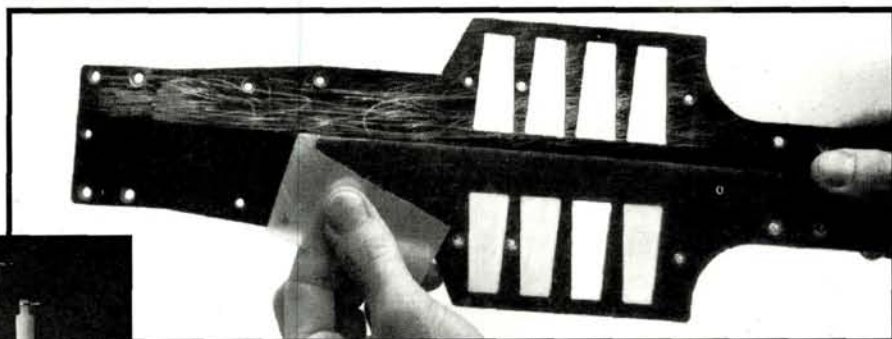


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SCOPING OUT

(Continued from page 141)

CAR TESTS

I decided to quit while I had some lab equipment left and proceed with the enjoyable part of the test—driving! I dug out the 17-page instruction book and began to install the T-1X in my Turbo Ultima. The book has few pictures, but lots of good instructions, including a detailed description of how to install the supplied motor capacitors. Novak correctly assumes that you'll attach this type of controller to a modified motor and that it will need good filtering. There's also a detailed explanation of how to set the knobs on most popular transmitters.

The section entitled "Power Wires" caught my eye. Novak's advice is the same as mine, i.e., keep the wires short, use good connectors, and if you direct-wire, avoid reverse-polarity connections to the battery. I cut the wires to the mini-

(Continued on page 232)

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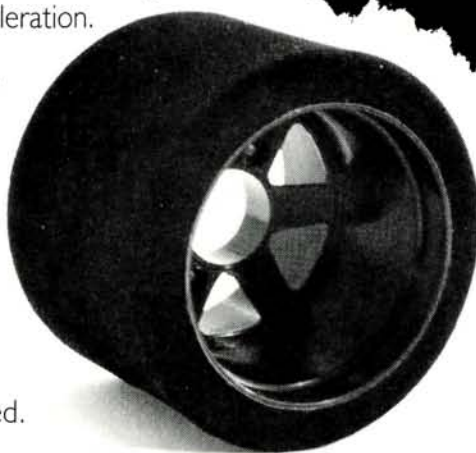
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SCOPING OUT

(Continued from page 230)

mum length that would fit my car's battery and motor setup and installed Litespeed connectors for the battery. (I always direct-wire my motor. If you're serious about R/C car racing, buy a good soldering iron and learn how to solder.) I then plugged in a battery pack and adjusted the controls.

The T-1X has a standard two-pot, one-LED arrangement built in. I don't like separate pulse checkers because they get lost and you have to unhook the motor to use them, so this built-in LED was great. The adjustment pots were a surprise. They're aligned perfectly with the hole in the case, and their large X-patterned head accepts a no. 0 Phillips screwdriver. (Of course, Novak's works well, too.) No metal is exposed in the adjustment holes, so it's virtually impossible to short-circuit the T-1X with a metal screwdriver.

Another thing that's different about the T-1X is the action of the LED. Most LEDs go out for neutral, burn dimly for "run" and brightly for "full-on." The T-1X's LED comes on for neutral, goes out for "run" and snaps on abruptly for "full-on." This sounds strange, but it's precise and deadly accurate.

This is starting to sound like a Novak ad, so I'll tell you one of the minor problems I had. I lost one of the rubber plugs that are used to plug the adjustment holes, but Scotch Magic Mending tape came to the rescue.

With a handful of 7-cell battery packs and my new Triad 10-turn modified motor installed, I headed to a track in Huntsville, AL. It takes raw speed to be competitive on this high-speed dirt oval with banked turns, and the T-1X defi-

(Continued on page 234)

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SCOPING OUT

(Continued from page 232)

nately had it! With this setup, the car was a screamer! The throttle response was smooth, the acceleration blinding (requir-

ing driver caution to avoid spin-outs) and the braking strong.

My only problem was glitching when the car was at a distance. I connected my external BEC to provide extra juice to the receiver, and the glitching stopped. This problem isn't unusual, but is just indica-

tive of a very hot setup. Novak makes a glitch filter called the Stutter Stopper that plugs directly into the receiver. This huge capacitor provides power to the receiver when the battery pack's voltage sags during heavy acceleration.

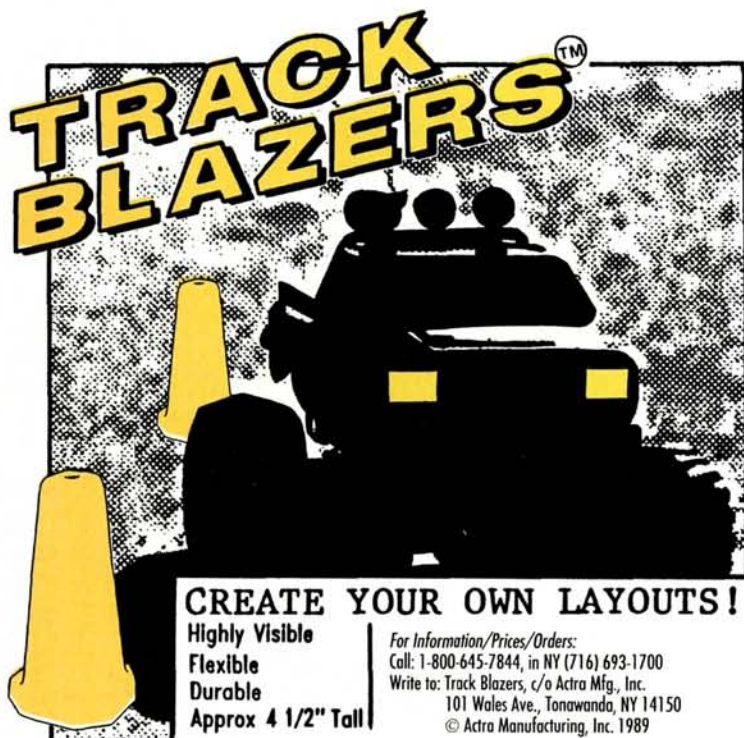
The T-1X was exciting to test. It's larger and heavier than most 6-FET speed controllers, but its resistance is a lot lower. If you participate in on- or off-road oval racing, or if you run in the heavier classes (e.g., 4WD and trucks), the T-1X will provide the extra voltage your motor needs. If, however, you run a small car or drive on a short roadcourse with lots of moguls and jumps—things that require light weight and a more mildly wound motor—you may want to consider one of the fine 6-FET speed controllers on the market.

We're back to our original question: do the top drivers use the T-1X because:

- A) they're afraid to try something different, or
- B) the T-1X is really the meanest, baddest speed controller around? As far as my lab is concerned, the answer is B!

**Here are the addresses of the companies mentioned in this article:*

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